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Accidents and Safety in New Zealand Logging: The Central Role of the Contractor

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Abstract

New Zealand logging has a high accident rate which has concerned health and safety personnel, accident insurers, researchers and members of the industry. Efforts to reduce logging accidents and to promote safety, have included development of better equipment and training methods, and understanding of patterns of accident occurrence. The research to date has been mainly quantitative, and focused on individual factors. The aim of the present study was to develop an understanding of the social processes which surround logging accidents to provide a broader perspective of accident causation and its implications for safety promotion.

47 loggers and 32 logging contractors from three regions of New Zealand participated in unstructured interviews which were recorded, transcribed and coded with the assistance of NUD.IST, a computer programme. Personal observations in the workplace and numerous informal discussions with a range of industry personnel, complemented the interviews. The qualitative methodology, Grounded Theory (Strauss & Corbin, 1990), was chosen to analyse the data.

The results show that loggers perceive that individual factors such as risk-taking, violation of regulations, training, experience, equipment used, and the physical environment affect safety. The analysis of the data revealed that the impact of all these factors is moderated by the contractor who, in such an isolated environment, has a dominant role in the crew culture. The ability of the contractor to organise and motivate workers so that time can be allowed for learning and using appropriate techniques was critical to the safety of the crew. Frequent restructuring of the logging industry, together with falling log prices, have created instability which has impinged on the ability of contractors to run their crews safely. Increased expectations for production have placed pressure on safety systems. Some contractors managed to maintain safety through a proactive approach to training, efficient systems, and a positive safety culture while still being able to improve production. There is a widening gap between contractors who have responded proactively to the changes and those who have resisted them and struggled to manage in the new environment.

Table of contents

	Page
Title page	i
Acknowledgements	ii
Abstract	iii
Table of contents	iv
List of tables and figures	vii
Note on identification of participants	vii
Vignette 1	viii
Vignette 2	x
 Chapter	
1 Introduction	1
Logging	2
Legislation	6
Developing the present study	10
 2 A brief history of logging and the formal and informal learning which has taken place in New Zealand forests	12
Early logging	12
Attempts to reduce accidents	15
The emphasis on safety	20
Formal learning today	22
 3 An overview of the forest industry	24
Indigenous and non-indigenous logging	24
The physical environment	25
The regions	25
Wind and heat	27
General trends	27
Infrastructures	28
Summary	31
 4 Accident literature review	32
Accident literature	32
Epidemiological approaches	33
Early research and accident proneness	34
The Domino Theory	35
Personality and characteristics	37
Error	41
Training	43
The technical/ergonomic approach	45
Risk	49
Violation	51
Enforcement and compliance	53

	Safety culture	56
	Behavioural model	60
	The Sociological systems approach	64
	Discussion	70
5	Method	71
	Aims of study	71
	Rationale for use of qualitative methodology	71
	Grounded Theory	75
	Procedure	78
	Analysis	82
	Previous knowledge and experience	87
6	Reasons for becoming a logger	89
	Non-specific reasons	90
	Way of life	91
	Self-image	96
	Rewards	99
	Need to belong	101
	General discussion	102
	Building blocks for a theory	104
7	Regulations	105
	Responses to the Health and Safety in Employment Act 1992	106
	The bush inspector	114
	Systems for implementing safety regulations in the crew	119
	Influences which shape perceptions of regulations	124
	The crew and safety	129
	General discussion	133
	Building blocks for a theory	135
8	Training	136
	Learning in the bush	136
	Perceptions of formal training	145
	Maintenance of the training	156
	General discussion	160
	Building blocks for a theory	162
9	Organisation	164
	Machinery and personal protective equipment	164
	Contract issues	172
	Production pressure	176
	Planning and communication	180
	General discussion	187
	Building blocks for a theory	190
	Organisation in logging	190
	Transformation of logging	191

10	Crew relations	192
	Financial incentives	192
	Symbolic appreciation	200
	Verbal appreciation	201
	Aversive interaction	205
	Contractor behaviour	209
	General Discussion	213
	Building blocks of a theory	217
	Crew relations	217
	Transformation of logging	218
11	Discussion and Conclusion	219
	Basis for a theory of the central role of contractors in accident causation and safety	223
	Ongoing changes and the transformation of contractorship	231
	Theory development	233
	Theory stage one: the Central role of contractors in logging safety	233
	Theory stage two: The evolution of logging contractorship	234
	Impacts of growing antipathy	236
	Recommendations	237
	Wider implications	240
	Limitations of the study	242
	Suggestions for further research	242
	References	243
	Appendix 1: Exploratory investigation	270
	Appendix 2: Ethics committee proposal	272
	Appendix 3: Informed consent form	278
	Appendix 4: Information sheet	279
	Appendix 5: Summary of findings	280
	Appendix 6: List of final codes	284
	Appendix 7: Personal communication list	289
	Appendix 8: Glossary	290

List of tables and figures

	Page
Table 1: Logging fatalities in New Zealand from 1979 to 1998	3
Figure 1: Accident causation, prevention and safety promotion	33
Figure 2: The contractor’s role in filtering influences affecting social processes which determine accidents in logging crews	224
Figure 3: A contractor centred theory in accident occurrence in isolated, unpredictable environments	230
Figure 4: The widening gap between transformational contractors and traditional contractors.	232

Identification of participants

Note: All the names of loggers, contractors, bush inspectors, and other personnel referred to in the text have been changed to prevent identification of participants. Names of logging contracting crews have also been changed. Place names have been changed where identification of persons might otherwise occur. Large forest company names have been changed where it might assist in identification of individuals.

Vignette 1

Factory without a roof

You need permission to go up this hill - narrow and dusty and steep. I make it to the top without meeting a logging truck coming down, feeling pretty hyped by adrenaline and dust in my mouth. A sign says "Falling in process, do not pass". I wander the other way, towards the sound of chainsaws, and find two fellers cutting tall straight trees across a felling face, which brings the trees down towards the road. One smiles and stops his saw. He says he'll take me down to the boss in the ute. We drive to the sign where he uses the radio telephone to get permission to come through. When we arrive at the skid site he solemnly hands me a hard hat and fluro-vest and grins. "You don't go nowhere here without this, mate."

Selwyn, the contractor, is talking to the driver of a hydraulic grapple skidder - standing in the middle of the skid. There are two excavator skidders moving backwards and forwards up the slopes to where the mechanical harvester - a Warratah - is felling trees and shredding the branches from them automatically, in a continuous motion. One skidder is completely employed keeping up with the Warratah, dragging the piles of logs down to the skid site for processing. The other services the manual fellers - the men I met earlier - who are working on slopes too steep for the harvester.

The skid site is huge and laid out like a mill yard - neat piles of evenly sized logs, all marked with coloured symbols indicating size, grade, and destination. A truck rumbles in and a loader spins round to begin heaping logs from one of the piles onto its back. Within minutes it is full and before the driver has tied the load down another truck has arrived and the loader moves on to this task. Men in the bright fluro-vests move about the skid, chainsaws whirring, spray cans and tapes at the ready. The logs are marked, cut, trimmed, and expertly manoeuvred onto the appropriate stack. Selwyn moves around the site, talking, listening, nodding, all the while making notes in a small book. He seems unhurried but purposeful. Finally he has time to greet me. "Hi - good to see the vest Steve - the supervisor will be here any minute and you'd be out the bush in a second without it. They're real tough on safety here and it's a damn good thing." He checks that my boots have steel toecaps, and gives me a few instructions on where to stand, where I can and can't go, what to watch out for.

We climb up through the trees to the manual fellers. ‘This is the danger area,’ says Selwyn, ‘all the trimmed branches lying everywhere - what we call the slash - no matter how careful you are you can make that one mistake and Bingo - you’ve sliced your leg.’ The fellers are moving along the side of the log, trimming branches, clambering in and out of the slash. They are wearing new, unripped chainsaw trousers - their chainsaws look new and well maintained. Visors down on their hard hats, ear muffs blocking the noise, they work rhythmically and with obvious skill. One feller stops and we chat briefly. He is hoping Selwyn will go over his tree felling stage two module at smoko. He has six modules and is keen to get more - especially ‘windthrow’ - he likes working in the windthrown trees, which are very dangerous, but wants to be well trained for it. He’s heard of the deaths that occurred during the aftermath of Cyclone Bola when untrained men worked in the chaotic windthrow down near Whakatane.

Back at the skid the trucks come and go. Selwyn is working on a new system for co-ordinating the skidder and loader so that it is easier felling the logs and reducing the clutter in one part of the skid. This is designated an environmentally sensitive forest block, and Selwyn has been chosen by the company to log it because of his special skills and ability to plan extraction efficiently but with little damage. He is trying to specialise in this field because he thinks it is the way of the future. He wants a well trained, safe crew, that puts out as much wood as possible with as little disruption as possible. “I’m always trying to be one step ahead of the company - I try to anticipate what will happen in the industry and make my move before the other crews. That gives me the edge.”

Selwyn sees worker-relations as paramount - later in interviews his employees all agree that he is a really good boss and it’s the best job they’ve ever had. “I used to have a hell of a temper, and go off at the guys. But then I made a conscious decision to not get angry at them. I take a breath and walk off if I feel frustrated. And my operation runs the better for it. I produce more, I haven’t had a notifiable accident in five years and I have a low staff turnover - which I think is a pretty good indication of a happy crew. ” I look around - everything is immaculate, running like clockwork. As one logger for another crew remarks to me rather laconically later, and with perhaps a tinge of envy, “Bloody factory without a roof, mate.”

Vignette 2

Up in the fringe woodlots

The road follows a narrow gorge as the hills grow steeper and the road twists deeper into the valley. In the summer this valley is clouded with dust from logging trucks and farmers cars. But in the winter the surface is greasy and water runs across the road at frequent intervals. The valley finally comes to an end and the road climbs upwards, deep into the hills and bush.

In the distance is a truck beside a freshly carved track. Clay and mud. Beyond is a scarred hillside, scattered trees sticking up from the steep sidling like remnant bones. Littering the face of the hill are the remains of logs, broken and split, heaped untidily in rough piles.

The track stretches away to the right, across a ford through the mud and a swollen creek. Suddenly around the corner comes a skidder, tyres spinning and rubber burning in the slush. The skidder lurches by. Tyres bald, diesel belching, joints rattling and hydraulic arms slopping and oozing oil. It shudders to a halt and Josh leaps off. He grins ruefully. " You come at just the wrong time " he proclaims. " You won't like what you see round the corner. Thank God you're not a bush inspector." Josh clambers onto an old bulldozer up the hill, and fires it up. It coughs into life, black diesel belching skyward. With a signal from his free hand Josh directs me to follow.

The track hugs the hill side, narrow to the point where I amaze at the daring of Josh - in places the road is shored up with small logs, some of which break away and roll into the gully as the bulldozer lurches along. Water cascades across the track in several places, trees hold on precariously to the bank above the road, roots exposed by the cut in the hill.

We climb steeply up to a clearing at the head of a gully where an old truck waits. A relic of logging days I thought were well passed. Mud is everywhere, and the small truck is stuck. The driver looks at me with much suspicion as I approach so I introduce myself as the bush inspector. He jerks back and Josh laughs uproariously. "Nah he's a boffin from Massey," Josh assures him, and then Ben laughs too. He jabs his thumb in the direction of some machinery tracks which lead over the edge of the skid site. I peer over and see to my horror a log loader twenty metres down the hill. Clutching onto the steering wheel is a man who is later introduced to me as Jack. He

looks more than a little apprehensive as he waits for help. He hasn't dared move. The loader is balanced precariously on an old log which sticks out of the gully. A wrong move and it will be gone another fifty feet to the bottom. "A hydraulic hose blew. We'd been using the forks as a brake," explained Josh. "Lucky these fullas are here really. I was working by myself until an hour ago and if I'd gone over I think I'd be history now."

I'm given the task of clambering down the fill to where the loader hangs. Ben feeds the rope out while Josh sits in the bulldozer, ready to take the strain. I very gingerly pass the wire rope around the nearest solid piece of the machine and then fasten the shackle. I scramble out the way and yell to Ben who signals to Josh and the bulldozer moves forward. The rope tightens and relief spreads across Jack's face. I struggle back up to the skid site and for the next half hour watch as Josh rears and bucks the old dozer, and the loader steadfastly refuses to be dragged back to safety. The tracks of the dozer dig deeper and deeper into the clay, and a small spring on the top side of the skid site begins to flow into the deepening ruts. Mud spits out from the tracks. Finally Josh digs the blade of the tractor so deep into the ground that it grips and as the water flows up and around the tracks he manages to winch the groaning skidder back up to a horizontal plane.

Jack tumbles off the loader, His face wet with sweat and yet as pale as a ghost. He looks shattered. Josh beams with pleasure. "Close one, close one" he chortles. Ben shifts nervously one foot then the other. He is obviously uneasy. "If we get any more of this rain I've had it," he declares. Jack says nothing. His shaky hand pours some tepid tea from a flask into a tin can he uses for a cup and he gulps it down. He subsides onto a log, still ashen and trembling, while Josh sets about replacing a hydraulic hose.

Jack had been loading and the loader had slipped out of gear, rolling half over the edge. Jack had thrown himself clear. "Lucky he didn't have a seat belt, see" says Josh. Then the loader had stopped and he'd got back on so they could pull it back up with the truck. However, instead of pulling the loader out they had nearly managed to drag the truck into the gully too. The shaking of the loose fill in the gully had made the loader slip further and further down the gully. At the last minute the loader had caught on a log half way down the gully and with Jack hardly daring to breathe Josh had taken off to get the bulldozer. Which was when I had come on the scene.

We sit and drink nearly cold tea. The rain which had been a light mist settles into a heavier shower and we shift to the shelter of the truck. "Shit!" says Josh suddenly. He leaps onto the

loader and, sluing and slipping in the mud, steers the machine in crazy arcs as he struggles to load logs onto the truck. Several times the loader comes close to the edge of the gully and Josh has to drop the forks down to prevent himself toppling off the lip. He revs the loader to a scream and mud boils up as it mixes with the rapidly gathering rain water. Time and again the loader seems inextricably bogged in the mud but somehow, with much bucking and rearing, Josh crawls up out of the mire and continues to load. Finally he has as much on as Ben will allow. "Enough," yells Ben and Josh somewhat reluctantly ceases the loading. He gives Ben's truck a shove from behind and it heaves itself out of the deep ruts and lumbers off down the slippery track.

Josh and I squelch our way through the mud to a hill face where scores of big logs are lying. Several are across the face of the hill rather than lying vertically. I ask Josh what would happen if he tried to limb them on that slope. He grins mischievously and says that was precisely what he intends to do. He clambers up the hill to one such log, and obviously showing a large degree of bravado for my benefit, proceeds to whip the branches off the tree. As he works along the hill it becomes apparent that sooner or later those branches which hold the log from rolling will be cut. And sure enough they are. The log rolls, bounces, then leaps high and crashes down the hill. Josh beams with pleasure once more. He follows the half trimmed tree down the hill and finishes the job. "No trouble. I spose I get a kick out of facing the challenge when it's dangerous -and beating it," he says.

He prefers to work on his own. No worries about ACC and training, no worries about having slackers on the job. He knows he isn't meant to work by himself but he's never been visited by the bush inspector and the day they force him into the mould is the day he would give up. He'd had a few employees but they broke your bloody machinery, and wanted more pay than he got himself. He wore a hard-hat sometimes but only cutting little trees. If you want time to get out the way of a big tree you need to be able to hear it when it begins to fall, so no hat and no ear muffs. His chainsaw trousers, which he calls 'chaps', are ragged and old. but he wears them. Almost like a badge. No mitt on his saw, no helmet visor. And his saw is as old as he is. The work he does is spasmodic and on the fringes, going where few contractors would dare, taking risks and working on an impossibly tight margin. The bank takes most of his profit in payment for his worn out machinery. But he loves the life. The risks. The challenge. And the freedom.

Chapter One

Introduction

With the advent of the industrial revolution, intense production of primary and manufactured products, brought greater scrutiny of work related injury and death (Gloss & Wardle, 1984; Purswell & Rumar, 1984; Saari, 1990). Dwyer (1991) notes that trade unions were among the first organisations to express concern about the “high and increasing incidence of accidents in industry and the fact that the victims of industrial accidents and their dependants were usually left with nothing except poor or charitable relief to live on” (Rennie, 1995, p. 117). By the late nineteenth century particular occupations were beginning to be identified as potentially more dangerous than others (Fabiano, Parentini, Ferraiolo, & Pastorino, 1995). Innumerable studies since then indicate that certain jobs consistently present higher risk to workers than others (e.g. Boyle, 1980; Leigh, 1986).

Manual jobs located in a changing environment, such as mining, fishing, farming, building construction, and forestry are amongst those which appear frequently in the literature (e.g. Hansen, 1996; Hasselback & Neutel, 1990; Pines & Halfon, 1987; Reilly, 1985; Stout, Jenkins, & Pizatella, 1996; Stout-Wiegard, 1988). In New Zealand, mining, fishing, and forestry are among the most dangerous occupations (Cryer, 1995). Forestry is a large and growing employer in the New Zealand economy and the accident rate is high (Kawachi, Marshall, Cryer, Wright, Slappendel & Laird, 1994). This is despite advances in personal protective equipment (PPE) and safety devices on machinery (Gibson, 1994b), as well as an increased focus on training and safety (Rowse, 1996). Kawachi, Marshall, Cryer, Slappendel, Laird and Wright (1991) conducted a large epidemiological study of forest workers which found that logging had consistently high accident rates. As a result of this study it became apparent that further research was required to investigate how human factors might contribute to accident levels.

Forest work involves activities such as planting, pruning, thinning and logging. Logging is the most dangerous job in the forest industry world-wide (Garland, 1950; Poschen, 1998a). The danger inherent in the use of machinery such as chainsaws, loaders and skidders, along with associated equipment like chains and wire ropes, wedges, jacks and axes, means that there is always the potential for accidents. When these are used in an ever changing environment,

particularly the steeper, wetter hill country on which many of New Zealand's forests are planted, that potential is greatly compounded (Gibson, 1994b). Such elements, along with aspects of organisation, training, and work climate, have been identified as potentially impacting on the level of safety and risk in New Zealand logging (Cryer, 1995).

Logging is continually noted among the highest risk occupations in countries where it has a large presence including the US, Scandinavia, Canada, Australia and New Zealand (Crowe, 1986; Garland, 1990a; Gaskin, 1988; Helmkamp, Kennedy, Fosbroke & Myer, 1992; Paulozzi, 1987; Stout-Wiegard, 1988; Vayrynen & Ojanen, 1983). The fatality rate in New Zealand logging is about 375 per 100,000 workers, seventy one times higher than the national occupation average (Brook, Brook, Kirk, Moffat, & Cummins, 1998; Fielder, 1997a). In 1950 Garland said logging was the most dangerous job in New Zealand. The epidemiological study by Kawachi et al. (1991) found that accident figures had only improved slightly since Garland's remark. OSH statistics (Bell, 1998; OSH Injury Control Bulletin, 1993a) confirm this stable state of forestry accidents. Baker, Melius and Millar (1988) note that officially gathered statistics on injury and accidents are often an underestimation of true numbers, supporting Bell's (1998) suspicions that New Zealand forestry accidents are seriously under-reported.

Logging

Fatalities

There is some variation in fatality levels in different countries. Helmkamp et al. (1992), investigating US fatality rates amongst loggers over a nine year period, report 289 deaths per 100,000 workers. Canada's loggers have a fatality rate of 54.3 per 100,000 workers (Hasselback & Neutel, 1990) which, while high, is noticeably lower than the US and New Zealand rates. The following table illustrates further that despite international trends of decline in industrial accidents during the seventies and eighties (Stout, et al.1996) logging fatalities in New Zealand showed no long term fall during that period (Dwyer, 1995).

During this period the logging workforce fluctuated, with a general decline from 1979 to 1988 (Kawachi et al. 1991), a rise from 1991 to 1996, and then a fall during 1997 and 1998 (L. Bell, 20th March, 1999, personal communication).

Table One: Logging fatalities in New Zealand from 1979 to 1998

	Fatalities
1979 - 83 (5 years)	21
1984 - 88 (5 years)	33 (source: Kawachi et al. 1991)
1991 - 95 (5 years)	48 (source: Gibson, 1994b; Logging Industry Accident Reporting Scheme; Bell, 1998)
1996 - 1998 (3 years)	30 (Source: Bell, 1998)

Serious Injury

Between 1979 and 1985, the rate of hospitalised injury averaged 3.87 per 100 workers (Kawachi et al., 1991). Bell (1998) estimates serious injuries to be 3.30 per 100 in 1994, 3.50 in 1995, and 2.74 in 1996 based on ACC claims. Bell notes that there appears to have been an estimated 20% reduction of serious harm injuries between 1995 and 1998, but he also suggests that “we [think] we are only getting about 20% intercept of serious harm [injuries] ... the inspectors (forestry) are thin on the ground and a high intercept rate is rare. Also I suspect that some employers are hiding their wounded and not going to ACC” (L. Bell, personal communication, 16th September, 1998). OSH Forestry Scientist Mark Fielder (personal communication, 20th September, 1998) maintains that while the industry is claiming that 1997 and 1998 figures have fallen, in fact there has been such a large lay-off of loggers during this period that while the total accidents may have decreased, the accident rate per logger actually working has very likely increased. For instance, he estimates that by mid 1998 Fletcher Challenge Forests had only 60 per cent of the crews that they had in 1996. The present research found that similar reductions were occurring in smaller companies and in woodlot crews.¹ Fielder says it is suspected that, as logging becomes more marginal, more hiding of accidents is likely.

¹ Woodlot crews are private crews with no fixed contract or affiliation with a company, which work on a freelance basis, contracting on a job by job basis to whoever they can get work with.

Despite advances in personal protective equipment (PPE) and safety devices on machinery since the 1960s (Gibson, 1994a; Houghton, 1995; Kawachi, et al. 1991; Proctor, 1982; Vayrynen & Ojanen, 1983), and an increased focus on training and safety since the mid 1970s (Rowsell, 1996), there has been little apparent progress in reducing serious accidents. This is in stark contrast to the findings of Stout, Jenkins and Pizatella (1996) who found substantial declines in forestry injury in the US during a similar period.

Logging industry developments

The forest industry in New Zealand has experienced major technological, social, cultural and organisational changes especially in the last twenty years (Adams, 1993; Kirkland & Berg, 1997; Roche, 1990). Ongoing development in technology may have assisted in the prevention of accidents (Laflamme & Cloutier, 1988). However, there have been major changes in ownership of New Zealand forests, and the type of terrain in which many forests have recently been planted. Contract systems and employment structures have also changed. Expectations for production and work rate have increased production pressure. All these changes may have counteracted some of the reductions in accident rates brought about by technological improvements (Rowsell, 1997; Sullman, 1998).

It is difficult to attribute trends in logging accident rates to a particular influence, but there is a clear difference between the accident rates of woodlot loggers and those contracted to companies. The former have an accident rate 60 times higher than the latter (Fielder, 1997a). Fielder, and Brook et al. (1998) suggest that planting trends indicate that the biggest increases in newly planted forests in New Zealand will be by private, smaller scale owners. Woodlot crews are prevalent in logging such blocks, suggesting that the accident and fatality rate could rise significantly in the next decade. Based on current accident rates, terrain and the type of crew likely to be logging many of the new areas, Fielder has estimated that by the year 2010, when much of this forest comes on stream, fatalities could reach as many as 60 per annum. If the pressures inherent in such operations are accentuated by continuing decline in world wood prices, injury rates could also rise. The implications for the industry are serious. There is a belief amongst many in the industry that if a factory had a workforce of 2,500 and had an annual fatality rate of 10 the factory would be closed down. Because logging has a dispersed, relatively invisible workforce, the high accident rate commands less attention from the media.

Effects of high accident rates

In high risk occupations the occurrence of accidents can frequently result in death or serious injury. Heavy machinery and other equipment, and the environment in which it is used, are fraught with danger (Fielder, 1997a; Leigh, Mulder, Want, Farnsworth, & Morgan, 1990; Rasmussen, 1997). Immediate effects are on those injured or killed, but there are further social and emotional impacts on families, workmates, the organisation, and society in general (Lanoie & Tavenas, 1996; Leopold & Leonard, 1987). Accidents can have political ramifications (Eisner, 1995), and economic impacts as well (Aaltonen, & Soderqvist, 1988; Gibson, 1994a; Kawachi et al., 1991; Lanoie & Tavenas, 1996; Leopold & Leonard, 1987). Industrial accidents have a more detrimental effect on the economy than absenteeism or strikes. In some cases the cost is as high as 2% of the Gross Domestic Product (Aaltonen, & Soderqvist, 1988; Slappendel, 1995a). Cost to the economy comes through lost production, increased use of the health system, the social welfare system and insurance claims. Slappendel (1995a) comments that New Zealand has about 130 work related fatalities each year and approximately 4700 injuries sufficiently serious to warrant compensation claims for income loss. Logging accidents comprise a sizeable proportion of these. Bell (1998), referring to figures for serious accidents reported to ACC, notes that the average number of serious logging accidents reported to ACC between 1994 and 1996 was 318, out of a workforce of approximately 2500. Thus, nearly 7% of accidents reported to ACC occur in logging, while loggers comprise less than 0.2% of the workforce.

Awareness of logging accidents

Within the industry, awareness of logging accident levels has increased over the last two decades. The Logging and Forestry Industry Training Board's (LFITB's) training scheme has a large safety component. Initially focused on company crews around the Central Plateau, the training scheme has gone on to become a nationally recognised scheme used by most companies and many woodlots crews (LFITB, 1996). Logging crews, particularly in company forests, have been encouraged to adopt safety systems (Gibson, 1994a).

There are costs associated with accidents for employers. Examples are increased insurance levies, lost production time, damage to machinery, and possible ramifications for the ongoing functioning of the work operation, especially in high risk industries. However, employers' awareness of accident costs does not necessarily lead to attempts to reduce accidents. Brody, Le Tourneau and Poiner (1990) found in a North American study that employers seemed

either unwilling or unable to reduce cost wastage caused by accidents. It was suggested that the typical employer failed to include wage costs, material damage, administrative time and production loss when estimating costs of accidents. Ignorant of the real costs, they allocated insufficient energy to reducing them. Perhaps because of this lack of awareness, government agencies take on the responsibility of reducing accidents, primarily through the implementation of safety legislation, and experience rated compensation.

Legislation

In the nineteenth century high levels of workplace accidents resulted in the implementation of safety and accident compensation legislation. Development of such legislation has continued. The degree to which legislation has been instrumental in reducing workplace accidents is unclear because other factors such as union power, worker contracts and current economic conditions may influence safety as well. Accompanying the evolution of safety legislation has been the development of legislation defining worker rights and employment conditions. Safety can be further facilitated or impeded by such legislation.

Health and safety regulations

New Zealand first recognised the need for safety regulation by adopting Britain's Fatal Accidents Act 1846. This gave the dependants of workers killed in industrial accidents the right to take legal action against the negligent person (Campbell, 1995). There were a number of further Acts, specific to New Zealand, passed in the latter part of the nineteenth century. Many were related to mining, such as the Regulation of Mines Act 1873 and the Inspection of Machinery Act 1874.

The different settings in which accidents occur can influence public perceptions and political attention. Single person accidents are less likely to be recorded by the media and brought to public attention. Mining accidents occur in workplaces with a lot of workers whereas in logging, small crews work in isolation away from large centres. As a result, mining accidents are more likely than logging accidents to involve many workers at one time (Kawachi et al., 1991). In the early days of logging many injuries and fatalities may have gone unrecorded, which explains why, despite its high accident rates, logging was not targeted for regulation in the way that mining was.

The emergence of the New Zealand Forest Service as a major employer of loggers after W.W.II brought a greater concern for safety in the forests. The service recorded statistics of accidents in its own forests and began efforts to reduce them (Appendices to the Journals of the House of Representatives (AJHR), 1940 - 50). The Bushworkers Act 1945 was the culmination of an increased interest in health and safety in logging and became the key legislation for the forest industry for nearly five decades.

Research which flourished after W. W. II raised the level of public and government interest in safety (Ellis, 1975). Heinrich's work on accident prevention had culminated in a landmark article in 1941 which declared that 88% of all accidents were caused by unsafe acts (Heinrich, et al., 1980). This led to a focus on workers' individual behaviour. Economic affluence in the 1950s also brought a focus on workers' conditions of employment (Singleton, 1984). However, Stout et al. (1996) contend that "prior to the 1970s, the risk of death or serious injury was broadly tolerated and considered an acceptable risk of going to work" (p. 76). At the end of the sixties, it was found that occupational accident rates were rising, even though there had been some effort to encourage safety (Dwyer, 1992). Increased accident rates were socially and politically embarrassing, and throughout much of the industrial world legislation was passed to address issues of safety (Nelson, Kaufman, Kalat, & Silverstein, 1997; Reilly, 1985) and adequate compensation (Dwyer, 1992).

In 1972, The Robens Committee in Britain claimed that industry specific legislation was too detailed and as industry became more complex and diverse there would be an excess of unmanageable legislation (Gun, 1993). Many countries began drafting generic Acts (Eisner, 1995), which shifted the focus from prescriptive to self-regulatory safety legislation. This moved the emphasis away from control of specific hazards towards risk management and voluntary compliance (Lamm, 1997).

Countries such as the USA and UK implemented self-regulatory health and safety Acts in the early 1970s (Dwyer, 1992; Purswell & Rumar, 1984; Watterson, 1990). New Zealand was slow to follow this approach, perhaps because of the emphasis on accident compensation entrenched in the government-administered ACC scheme of 1974. However, by 1987 radical changes in addressing health and safety had begun. This culminated in the Health and Safety in Employment Act 1992 (HSE) which shifted the financial responsibility for accident prevention from the government to the employer (Lamm, 1997). The ramifications of the

HSE have been profound in shaping perspectives on New Zealand industrial safety, by placing greater liability on the entire chain of command within each work setting (Kiely & Langton, 1994).

The number of prosecutions for workplace accidents more than doubled between 1994/5 and 1995/6. Penalties were increased but were not as harsh as in some other countries. For example, in Australia maximum penalties for serious breaches range from \$250,000 to \$500,000, whereas New Zealand's maximum fines range from \$50,000 to \$100,000 (Kiely, 1997). In Canada fines are as high as \$1 million, and a term of up to three years imprisonment can be imposed for breaching the Forest Practices Code (Fielder, 1996a). Kiely states that the vagueness of what defines 'all practical steps' which employers must take to prevent accidents has meant the judiciary recognises "that there must be some limit to the liability for employers and people in control of workplaces" (p. 206). It is difficult to ascertain yet whether the introduction of the HSE has had any effect on logging accidents. There has been no apparent decline in logging fatalities but the turmoil in the industry has resulted in so many changes that any positive effects are likely to have been hidden. An event which has apparently had effects on logging safety was the enactment of the Employment Contract Act 1991 (ECA).

Employment contracts

In 1991 New Zealand implemented the ECA, which has had considerable effects on industry. Union membership, which was 683,006 within 259 unions prior to the Act, dropped to 428,160 with 58 unions by 1994 (Harbridge & Hince, 1994). They note that there was a "demonstrable erosion of equity principles in establishing wages and other conditions of employment. This erosion is likely to continue" (p. 592). Until the 1990s 60% of New Zealand's workforce was employed under a union-negotiated collective contract. Industrial conciliation and arbitration were used to solve disputes. Harbridge and Hince suggest that the ECA fails to comply with the International Labour Organisation Conventions 87, (Freedom of association and protection of the right to organise), 98 (Right to organise and collective bargaining) and 154 (Collective bargaining). The Act fails to require the employer to take part in any bargaining; though the employee can have an agent to bargain on his/her behalf, the power to decide whether there should be any bargaining rests solely with the employer. The potential this situation presents for abuse of employees where unions are weak or non-

existent, and especially where a relatively uneducated, isolated workforce is concerned, is very great.

Harbridge (1993) suggests that this new environment led to many workers receiving pay cuts and in some cases worse conditions of employment. Moreover, it appears that many workers, especially those in small operations, do not have an employment contract at all (Department of Labour, 1992; Harbridge, 1993). Where unions remain strong, erosion of conditions and rights is less severe. However, in the forestry industry there is little union presence. Workers no longer have resort to assistance in the case of unacceptable conditions, whether monetary or in terms of safety. By contrast, in Canada the union plays a vital role in determining conditions of employment, and is also represented on the Workers Compensation Board which controls enforcement of safety regulations and compensation for accidents (Fielder, 1996a). Significantly, Canada's accident rate in logging is considerably lower than New Zealand's.

Accident compensation

The other area of legislation which impacted on safety in the workplace concerns compensation. Britain's Workmen's Compensation Act 1897 was adopted by New Zealand in 1900 and this endured, albeit with some modification, until 1974 (Rennie, 1995). In 1974 the Labour Government introduced a new compulsory accident insurance scheme to New Zealand which was based on a no fault, no litigation premise, administered by the government run Accident Compensation Commission (ACC). Funds for enabling workers compensation for injury or death came from levies collected from employers, together with direct taxation (Campbell, 1995).

The reliance of the original ACC scheme on a no blame, no fault system may have provided a disincentive for safe work behaviour, with insufficient responsibility being taken by employees and employers towards accidents (Duncan, 1995). Costs to the ACC in maintaining payment to beneficiaries was considered too great to sustain. As part of an effort to counteract this, the Accident Rehabilitation and Compensation Insurance Act 1992 (ARCI Act) introduced experience rating (Campbell, 1995), which discriminates between employers by basing levies on accident rates. It is not clear to what extent this has impacted on accident levels or safety behaviour. As in the instance of the HSE, other influences have clouded the overall picture.

Developing the present study

The ACC funded research into accidents with the intention of identifying specific areas where accidents occurred, why they occurred, and how they might be reduced (Houghton, 1995). The epidemiological study of forestry accidents by Kawachi et al. (1991) was one such study, which led to a greater understanding of the demographic and geographic variations in forestry injury. The authors suggested that further research was required to investigate factors which possibly contribute to accidents. Houghton noted that there was a need to investigate the psychological characteristics of the workforce and the factors which influence forestry workplace safety.

There is a strong focus on safety in the training standards promulgated through the LFITB system. Since some logging crews used the system and some did not, it was considered by ACC, and the authors of the epidemiological study (Kawachi et al., 1991), that training might be a crucial factor in accident levels in the forest. This is supported by the findings of Probine, Grayburn and Cooper (1987) who found untrained forest workers operated more dangerously than trained workers. Evans (1984) likewise found that training improves technique and reduces risk taking. Dammerud (1989) reported that what he describes as a massive reduction in accidents in New Zealand forestry could be attributed to training. This provides evidence for a claim by some companies that LFITB Forest Industry Record of Skills (FIRS) modules have improved quality and safety and reduced turnover (Vitalis, Ramsey, Toulson, Tweed and Smith (1986). It must be noted that not all studies support the notion that training improves safety. A 1996 New Zealand study by Fielder (1997a) found no difference between accidents experienced by fellers with high levels of formal training and those with few or no qualifications. However, the Kawachi et al. study indicated the need to investigate the possibility that there was a link. In 1995 the ACC commissioned a project to investigate the suggestion that training may assist in reducing accidents in the forest. The project is currently in progress (H. Moffat, personal communication, 3rd October, 1998). It has as its main methodology the use of quantitative survey and analysis, supplemented by some qualitative research.

The present study commenced in conjunction with the above mentioned ACC study, with a doctoral thesis as the intended result. In the course of determining the direction of the ACC study via an exploratory investigation, it became clear to the present author that variables beyond the suggested scope of the ACC study might contribute to accident levels in the

logging industry. The exploratory investigation, conducted early in the research, indicated considerable variation between and within crews in perceptions of learning, training, and risk taking behaviour. It was evident that other aspects of the operation, including expectations for production, work rates, and conditions of employment from the contractors and companies, might conflict with a positive safety climate in some crews. Such variation would be very difficult to allow for in a survey acceptable to the workforce. It was felt that the intricacies and complexity of the industry, the literacy and educational levels of the workforce, and the possible suspicion with which that workforce might treat questionnaires, lent itself more to qualitative methodology. This would allow a flexible approach to variation (See attached exploratory investigation Appendix 1) not possible in a written survey-based quantitative approach. Because of the perceived need to approach the subject from a different stance, the present research was separated from the ACC study and continued on its own. The present study retained the goal of investigating the influences training had on safety in logging, but within the broader goal of investigating the overall functioning of logging crews, and the processes operating within them, in order to assess how those processes affected safety. A primary goal was to identify those processes within different crews which assist or hinder the development of a positive safety climate in logging crews in New Zealand. Therefore this study explored these issues in woodlot and company crews in three different regions of New Zealand: the Far North, Manawatu/Southern Hawkes Bay, and the Central Plateau.

In an industry such as logging, safety comprises an important part of crew culture, organisation and training because of the inherent danger in many regular activities in the operation. In New Zealand logging there has only been a formal training system in recent years (Rowse, 1996). However, skills, knowledge, methods and techniques associated with both production and safety have evolved which have been passed on from one logger to another since the arrival of Europeans two hundred years ago. The way these have evolved and the social context in which they developed, are an important background for the present study. The following chapter will give an overview of that history, and an account of the development of the logging industry.

Chapter Two

A Brief History of Logging: the Development of Safety Related Processes in New Zealand Forests

This chapter provides an historical background to the development of logging in New Zealand, with an emphasis on the acquisition of the skills necessary for performing the tasks required of a logger. As with other phenomenon, the current beliefs, attitudes, organisational structures, practices and methods of logging in New Zealand are bound up in its history and traditions. While society has evolved, technology advanced and culture changed, there are still residual effects of the past in the collective memory of the current members of this industry. The rugged environment and equally rugged conditions of the past enterprise elicited particular behaviours and attitudes that are revered, glamorised and often perpetuated in today's environment. An acknowledgement of the isolation which allowed logging culture to develop, somewhat removed and distinct from that of a rapidly urbanising society, is important for understanding current perceptions of this country's forest industry.

An historical grounding is an important part of any analysis of collective behaviour because of the impact that traditional practice has on current practice. This is especially true in qualitative analysis, where an understanding of the historical basis of a phenomenon lends credibility to the investigation by strengthening its internal validity (Layder, 1993; Lincoln & Guba, 1985; Owens, 1982). At the same time, it provides a broader context in which the findings of a given study may be considered (Denzin, 1970).

Early logging

European explorers arriving in New Zealand in the 18th century noted the presence of the tall trees suitable for ships spars (Fleet, 1984). They also noted the difficult terrain, steep slopes, inaccessibility, and bad weather which impeded logging and made it very dangerous (Reed, 1964). Sailors acted as loggers, and Maori helped haul logs across this harsh terrain using primitive equipment (Adams, 1973; Halkett & Sale, 1986). Many trees were in gullies and the task of hauling them using capstans and winches was daunting. It was swampy, tackle broke and ropes fouled on stumps. Sometimes it took two days to drag out a single spar (Fleet, 1984).

As logging increased, whalers, gold miners and penal escapees from New South Wales became prototype bushmen (Adams, 1973). A reliance on Maori and itinerant Europeans for labour in the bush developed (Reed, 1964) and most of the latter were rough and ready individuals (Roche, 1985). Logging was destructive and ill-conceived, haphazard and anarchic (Hutchins, 1919). Little was expected of the workers other than hard labour. Many deaths occurred, due to the dangerous conditions (Reed, 1964). Men worked long hours with axes, saws, ropes and tackle. No safety equipment is ever mentioned in the literature. Only the arrival of European timber men with some logging skills allowed the timber trade to develop fully, as their techniques were developed and adapted (Wigglesworth, 1981).

From these beginnings, most learning in the bush occurred by trial and error, sharing of information, and imitation of those with expertise. The need to survive led to ingenuity, and methods evolved to suit the environment (Reed, 1964). The backbreaking work demanded not only strength and endurance but also skill, particularly as the more readily logged trees disappeared. Basic techniques were borrowed from loggers arriving from Canada, but the New Zealanders adapted and improved methods and added new ones to suit the unique local conditions. Diamond and Lowe (1985) mention “the reusable kauri timber dam [used to drive logs to the sea] found in northern New Zealand became unique in the world...[and] construction [of] tramways over ridges tested the inventiveness and ingenuity inherent in bushworkers” (p. 19). This presumed inherent ability to invent and adapt was noted early on and, according to the literature, pervaded as a notion amongst members of the industry until the advent of formal training in the early 1970s (Diamond & Lowe, 1985; Halkett & Sale, 1986; Poole, 1969; Reed, 1964; Sale, 1978; Sutherland 1983).

By the second part of the 19th century, knowledge and expertise were well developed in the New Zealand bush. New workers learned from experienced ones. Those who were successful survived if they had “initiative, inventiveness and determination” (Reed, 1964, p. 77). This was the norm for almost one hundred years. The milling of native trees remained the major type of logging until the large blocks of exotic species, planted early in the twentieth century, reached maturity and became available for logging.

The large scale planting of exotic species by the New Zealand Forest Service began in the early twentieth century, when the government realised that the country’s timber resources were dwindling. Because native trees grew relatively slowly, it was decided that fast growing

exotic trees should be planted (Poole, 1969). This represented a key point in New Zealand logging, because it led to the plantation forests that now predominate in New Zealand, and which require different methods for harvesting than naturally grown trees. The development of the Forest Service and the initiatives in planting vast new forests are documented in the Appendices to the Journal of the House of Representatives (AJHR), which contain annual reports from the Forest Service's Director General to Parliament.

From 1920 to 1935, large scale planting established the basis of most of the New Zealand Forest Service forests. Unskilled soldiers had returned from W.W.I needing work. They, along with prison labour and the unemployed, were considered by the New Zealand Forest Service to be ideal for the planting envisaged. Consequently, prisoners, ex-soldiers and the unemployed, were used to plant the bulk of the forests (AJHR, 1918-1935).

The Great Depression brought further use of unemployed men in the forests. Most of them were unskilled in forest work, and, though the AJHRs reported difficulty with labour, little is recorded of any efforts to provide workers with stable employment, safety equipment or training (AJHR, 1920-1935). The use of low skilled labour created a poor public image of bushmen, which was sustained after W.W.II. (Entrician, 1957). This negative perception of forest work in New Zealand was reinforced by unemployment schemes in forest-based activities until recently (AJHR, 1950-1987; C. Sutherland, 25th February, 1997, personal communication).

It is important to appreciate that the current image of a forest worker in New Zealand has developed from the history as outlined above. This influences who is likely to choose logging as a job, and what beliefs and attitudes they bring with them to the workplace (discussed in more detail in chapter 6). In Sweden and Canada, loggers are considered to be higher on the socio-economic scale than in New Zealand (Fielder, 1996b). This may be the result of higher pay rates. In Canada the average logger gets \$98,000 per year, more than twice the national average wage of \$45,000. The average logger in New Zealand gets approximately \$35,000 per year, which is barely the national average wage. Canadian loggers' pay rates may induce them to stay in the job longer, to gain greater skills as a consequence, and thus elicit a better public image. The average age for loggers in Canada is forty five compared to New Zealand's average of twenty eight (Fielder, 1996a).

Attempts to reduce accidents

Problems with retaining labour continued until the advent of W.W.II, when further changes occurred in the industry. Men who had picked up skills in the forests were called away to the war, and often replaced by unskilled workers. The AJHR, in 1940, mentions this problem and the difficulties with safety. A labouring staff of 1399 had 251 lost-time accidents. Concern about this led to some action. "It is believed that by educational and propaganda work it should be possible to reduce accidents which occur owing to improper methods of carrying and using sharp edged tools" (p. 6). In 1942 and 1943, accident levels fell, though staff numbers also fell. The Director General predicted that as a result of printed warnings and posters illustrating the common causes of accidents, figures for the following year should show a substantial reduction. In fact, in 1944, with staff numbers at only 915, there were 252 accidents, including four deaths. Concern grew that the large percentage of unskilled labour in the service would increase accident rates even further. It was presumed that following the end of W.W.II there would be a huge pool of unemployed labour but instead, the economy boomed and there was a shortage of labour (AJHR, 1944 - 50). Those who joined the Forest Service as labourers were the least skilled in the work force. The forests planted in the 1920s were coming on stream. The Director General reported in the AJHR, C3, 1947 "All previous conceptions of logging, saw milling and other means of utilising either indigenous or exotic forest resources must be abandoned. The immensity of the task, as measured both by the output and by the operating economy which must be achieved, makes it virtually impossible for the rugged individualism of the laissez faire period to be any longer capable, either physically or financially, of adequately coping with the problem" (p. 14).

An attempt was made to attract workers from Europe as semi-skilled labour. However, many loggers remained unskilled, and as logging increased so did the number of injuries. Courses were devised to encourage the skilful use of new equipment and to train returned servicemen as leading hands (Fielder, 1998b). It was hoped that the year long, on-the-job, '*Leading Hands*' courses would improve quality and quantity of production and assist in reducing accident levels (Fielder, 1997b). However, in 1950, with a Forest Service staff of 2026, accidents rose to 510.

In 1951/52 the '*Leading Hands*' course was abandoned and '*Woodsmen's*' courses were established (AJHR 1952). Schools in Rotorua and Nelson were set up to teach basic forestry skills, as well as some administrative procedures, to school leavers between 15 and 17 years

old. There was the hope that woodsmen emerging from the new courses would create a stable nucleus within the workforce. This would enable loggers working with them to learn many of these skills. However, most qualifying woodsmen became administrators and the problem of untrained loggers, especially those employed on a casual basis, remained (Wood & Cooper, 1997). The Forest Service maintained there was a need to “provide men with safe equipment and train them to its proper use and to a careful approach to the work. Safety officers are thoroughly pursuing this aim” (AJHR, C3, 1954, p 47). Despite these initiatives, accidents continued to rise, reaching 684 by 1962. Although staff numbers were a little higher, the ratio of accidents to staff was still higher than in 1950, and it rose further in the next two years.

As well, turnover in the logging workforce remained at well over 100%. The Director General noted: “Men do not stay long enough in the job to gain that instinctive awareness of near danger or to develop methods of work to counter it which comes naturally to workers with long experience” (AJHR, 1956 p. 66). Forest Service staff numbers continued to rise and while woodsmen schools provided trained staff for skilled forest work, no attempt was made to provide structured, formal training for the casual workers. From 1965 to 1967 accident rates fell, which the service cited as evidence of benefits of the woodsmen courses. However, in 1968 and 1969 accidents increased again (AJHR 1965-70).

The growing number of unemployment schemes brought inexperienced workers into the Forest Service. Whether this influx of inexperienced workers brought an increase in accident rates is unclear, because the Forest Service reports in the AJHRs from 1971 onwards ceased to mention safety or accident levels. No reason was given for this. It is interesting to note that in the early days of logging after W.W.II much was made of the accident rate and associated attempts to reduce it. Numbers of accidents and fatalities were reported yearly. It seems that when posters and safety promotion, and then training of leading hands and woodsmen did not bring results, comment on safety ceased.

In 1972, the new Labour government adopted many of the recommendations from the Woodhouse Commission. This recommended a more active promotion of safety and that the state should provide all compensation for accidental injury (Campbell, 1995). In the early seventies, it became apparent that accident rates were costing industry considerable money and time (Kawachi et al. 1991). The forest accident rate was so high that the government informed the industry that it must either do something to bring the figures down, or face

legislation (G. Steele, 13th March, 1997, personal communication). There was an assumption that unacceptable accident statistics indicated that lack of training for all loggers was at the heart of the problem (Beyer, 1978). While woodsmen were trained for three years at a woodsman's school, anecdotal evidence suggests that many handed this knowledge on haphazardly to the workers whom they supervised (D. Henderson, 30th March, 1996, personal communication, B. Haggart, 16th July, 1997, personal communication; R. McAslan, 21st October, 1997, personal communication).

Production expectations in New Zealand Forest Service forests had increased since the fifties (Fielder, 1998b), but were low compared with the 1990 levels recorded by Houghton (1995). Hence the production pressure which could produce mistakes was not unduly high. On the other hand, standards were low, skill levels varied, and equipment was often poor. The high worker turnover meant there was little chance to build an adequately trained work force (AJHR, 1950-1980).

There was a dramatic shift in production expectancy as Tasman (a private forest company which later became part of Fletcher Challenge Forests [FCF]) and NZFS changed their emphasis from native to exotic logging in the 1960s and early 1970s. Loggers relating stories from that era recall that two or three men might work in felling one or two large native trees and thus could spend time discussing the best method of achieving that. The new regime demanded that 50 or 60 smaller exotic trees be cut. This constituted a major change in extraction style and in the expectation for greater volumes of wood to be produced.

In 1974, Tasman, Kaingaroa Logging Company (KLC)(later taken over by Fletchers) and New Zealand Forest Products (NZFP)(now part of Carter Holt Harvey [CHH]) each began promoting training programmes developed by experienced loggers. They aimed to improve production, raise efficiency levels and increase safety, but only for their own company (Beyer, 1978). A report commissioned by the Labour Department recommended a unified training programme to reduce accident levels, and improve work performance, motivation and job satisfaction. It noted that accidents had fallen following the introduction of NZFP's training programme from 13.2 per 100,000 man-hours in 1973, to 3.1 in 1975 (Groome, 1979). By 1977/78 expert loggers, working under the guidance of a steering committee comprised of representatives from each company, developed a set of standards called the *Loggers Certificates*. Trainers were appointed and simple booklets produced as a basis for training,

coupled with occasional training workshops for the trainers. The booklets did not contain training instructions. Rather, they itemised skills and knowledge a worker should attain before certification. A forestry based industrial training board known as the Logging and Forestry Industry Training Board (LFITB), was established. Its role was to ensure systematic training was provided in the Bay of Plenty region. LFITB undertook to train trainers and provide assessment of the training. LFITB staff had no experience in designing a training programme or in the training or assessment of trainers (Annual reports of LFITB, 1979 - 1982). Thus it was an ad hoc approach.

By 1981, there were 538 Loggers Certificates issued. The programme was still focused on the originating companies and New Zealand Forest Service on the Central Plateau. It was determined that the scheme should extend further afield (Annual Reports, LFITB, 1981 - 1984) and a second base was set up in Nelson, with other companies being encouraged to participate. As the scheme expanded, the loose and informal system was reassessed and modified.

The Loggers Certificates were specific to three areas of the operation: felling, skid work, and machinery. Skills for each area were contained in each certificate. In 1984/85, LFITB set up a Forest Skills Programme (planting, pruning and thinning), which was structured in module form. This was a model for the Harvesting Certificate, which later replaced the Loggers Certificates. Each module contained a set of skills which could apply to several or all parts of the operation.

In 1987, the dissolution of the New Zealand Forest Service took place and two state owned enterprises were created: Timberlands and the New Zealand Forest Corporation (Roche, 1990). New Zealand Forest Corporation took over the Forest Service forests of the Central Plateau. There was a loss of hundreds of workers, and many trainers were also laid off. LFITB was dependent for its survival on continuing to build on the numbers of forest workers registering with its system, the biggest number of which had come from New Zealand Forest Service, which had also assisted in funding the board. It was feared that that funding would no longer be available. However, the newly created state owned corporations took over Forest Service's role in the interim.

In 1987/88, available logging trainer/assessors fell by 33% as a result of the lay-offs (LFITB Annual Report, 1988). There was considerable gloom amongst workers about prospects in the industry as a consequence of the big lay-offs. The number of trained workers in the workforce dropped dramatically, as did applicants for training. Following the break-up of the Forest Service, forest companies and the new Forest Corporation began to dismantle the wage crew system and replace it with contract gangs. It was recognised by the industry that existing contract crews had a higher production level and were more innovative in developing new systems and using new technology (B. Vincent, 12th December, 1995, personal communication). But many of those who now became contractors had been foremen and leading hands with either the old Forest Service or the bigger companies. While they had the prerequisite forestry skills, they did not necessarily have the management skills. Within the first 18 months of the new system's inception, more than 30% of contractors had gone bankrupt (B. Vincent, 20th June, 1996, personal communication), but production increased markedly. More than twice as many tonnes were produced per worker in the late eighties as in the late seventies (Houghton, 1995).

In the early stages of LFITB's history, the companies and New Zealand Forest Service nominated workers and contractors for training. Now the new corporation and the major companies began to hand this responsibility over to the contractors, though in some cases they continued to provide free trainers. The contractors were unused to developing and promoting training, and thus a vacuum was created which led to LFITB becoming more proactive in promoting training. They targeted contractors in order to bring about a change of attitude and make them aware of their responsibilities regarding training and safety (M. Newbold, 12th December, 1996, personal communication)

As the system expanded, distances required for travel and the demands on a small staff made it economically and strategically prohibitive to provide assessment using independent assessors. Ongoing assessment became the responsibility of trainers as well. To maintain the independence of the system, moderators did spot checks of both training and assessment processes. This system was more in keeping with expectations in the nascent national education framework. In 1989/90 the Vocational Training Council (VTC) was disestablished and the New Zealand Qualifications Authority (NZQA) and the Education Training Support Agency (ETSA) were formed. The new system opened up funding to a wider range of

potential training providers. NZQA required that LFITB provide accreditation for the training providers.

Thirty one modules were developed for forestry work. To achieve the National Certificate in harvesting, 13 modules were required. The old Loggers Certificates became redundant but there was some recognition of skill levels achieved, in that these could be transferred to the FIRS system. The module system required presentation within a competency-based framework. To meet NZQA and ETSA requirements, LFITB later re-wrote their programme into units which defined clear standards. It was a more prescriptive system than the old modules, and even more so than the original Loggers Certificates. The unit standards have been adopted, but LFITB has retained the module system and worked the unit standards into those.

The emphasis on safety

The Health and Safety in Employment Act 1992 became a focus for safety standards in the FIRS modules. The act included the tenet: all workers employed in the industry should be trained to a level sufficient to ensure their own safety and that of their fellow workers. It was deemed the responsibility of the entire organisational chain, from the owner of the forest through to the worker, to take all practical steps to ensure the training and safety was carried out. In logging this can include the forest owner or farmer, the forest company, the supervisors, contractor, foreman, and the workers themselves. This tenet appears to have strongly influenced Forest Owners' Association (FOA) policy. Although no part of the act demanded written evidence of training, some documentation of training was required in the instance of an accident investigation. An employer unable to produce evidence of training in the event of an accident is open to prosecution. If adequate training has apparently been provided, the employer is exonerated from blame, at least regarding obligations to provide adequate training.

A further influence was the introduction of experience rating of ACC levies. Some of the levy is based on accident records, further stressing the importance of training and safety. However, research suggests that where such systems are implemented, suppression of accident statistics increases markedly, and a punitive levy system is no sure way of raising safety standards (Hopkins, 1994).

In 1993, the FOA passed a remit which deemed that by January 1996 all workers in their forests must be either trained or in training. Although the deadline was not met, it resulted in a concerted effort to get as many people as possible in training. In November 1995, the number of workers training for silviculture or harvesting reached 6000. By April 1996, it was up to 6500, and by March 1997 more than 8500 were registered as having completed LFITB modules (this does include those who have left the industry but still hold certificates).

New pre-employment training from government funded schemes presented LFITB with new problems. Previously, the training had been largely on-the-job with a combined focus on skills, safety, and production. The latter was a vital element in the programme, particularly for the contractor who was employing the worker. To succeed in a given module, workers had to show that they could sustain a certain output on the job.

Emphasis in pre-training was different. Private training providers such as polytechnics used the FIRS modules (R. Gale, 3rd May, 1996, personal communication) but taught at the students own pace. Safety was emphasised rather than production. Consequently, while the skills and knowledge acquired by students were accepted, LFITB insisted that they must show proof of ability to work in the industry at an acceptable production level before modules were accredited.

The Forest Industry Training and Education Council (FITEC) was established in 1990/91 to administer forestry training and to control training funding. From 1996, FITEC contracted LFITB to identify specific training needs in the industry and provide those and insisted they be more prescriptive in their approach and hence less independent. The tendency of the LFITB to maintain a flexible, non prescriptive, reactive role led to serious disputes with FITEC. Because of its longevity and dominance in training in the forests, and because it has become the unofficial setter of standards, the entire industry had become geared to the LFITB system. However, in August 1998, LFITB ceased to be an incorporated society and was sold to two staff members. It now acts as a private training provider. FITEC has taken over the role of keeping records of training in the industry and of developing the standards for training.

During the existence of LFITB, the big companies developed systems for implementing training in their forests using the FIRS standards with their own trainers. In July of 1997, Fletcher Challenge Forests (FCF) and Carter Holt Harvey (CHH) withdrew their free training

systems from the forests, moving the responsibility, organisation and costs to the contractors. The companies maintained that the added cost to the contractor would be built into the tender price. There are still some companies that do retain trainers, including Earnslaw One, which was part of the current study.

Formal learning today

Different systems

There are three main systems of training currently operating in the forests. There are courses, mainly based at polytechnics and with community based work trusts, which provide 'pre-entry' training. They are used as a method of entering the industry with some qualification. Trainees are given a combination of classroom work and practical experience in logging. There is variation in course details and in the emphasis on instruction versus experiential learning. Pre-entry courses are based on the FIRS modules, although extra elements such as life skills are often added. Courses vary in length but most are either half or full year, along the lines of polytechnic semesters.

The second training system is on-the-job, where company trainers make regular site visits and train specific members of the crews for modules. There is little or no classroom work. Most of the theory is briefly discussed and the trainee is expected to learn the rest in their own time. Some instruction is given in skills. In most instances, trainers rely on members of the trainee's crew to assist in the training process. Often the trainer acts more as an assessor, leaving the training to the contractor. A few crews have their own on-site trainer.

The third system entails independent trainers coming to the crew and doing brief periods of training for perhaps one or two days, then assessing the trainee for learned skills and knowledge at a later date.

In the course of the interviews, and subsequent to them, there were many changes in the industry which affected training. FCF and CHH ceased to provide their own trainers and equipment. Trainers now must contract for work with individual logging crews. The other companies vary in how much assistance they give to crews. In woodlot crews and company crews where no trainer is provided, a private trainer may be contracted to spend between one hour and a few days running a course teaching particular skills.

Becoming a trainer

To become registered trainers/assessors, loggers must hold certificates in modules they will be assessing. They must attend a week-long 'Operations Workshop' held by LFITB. During this week, the logger is given some instruction in training methods, man management and motivation. The LFITB has no structured system which defines how training should take place.

The unit standards contain sets of performance criteria which must be met before a trainee is deemed competent. The trainer indicates in the training booklets when the trainee is regularly meeting the criteria and is thus ready to be assessed. At that point, the assessment is made and if the trainee meets the standard a module is awarded. Hence the requirements of the Health and Safety in Employment Act 1992 are met.

Logger training in New Zealand has thus undergone considerable change, largely in response to changing conditions in the industry. Polytechnics are, at present, playing a larger role by adapting to new demands and anticipating new needs (R. McAslan, 7th November, 1998, personal communication). Other training providers are adapting and developing (G. Steele, 1st November, 1998, personal communication). With fluctuations in the workforce, and the economic uncertainty of the industry, it is likely that more changes will occur.

Logging in New Zealand has taken place in a unique context, geographically, economically and socially. In order to provide a context to the present study, an overview of the logging industry in the three regions included in this study will be presented in the following chapter. The reasons for choosing these regions is outlined in the method section.

Chapter Three

Overview of the Forest Industry

This chapter will give a brief overview of the forests, and the geography and structure in which logging takes place in the three regions selected for the present study. It is presented in order to give the reader an understanding of the context in which the loggers in this study work, and particularly to give an understanding of the natural environment which, in itself, presents hazards to loggers.

Indigenous and non-indigenous logging

Until the planting of non-indigenous species, New Zealand loggers harvested the naturally growing (indigenous or 'native') forests. Most of New Zealand was covered in indigenous forest prior to the arrival of Europeans. These were temperate zone rain forests with randomly growing mixed species, mainly of the podocarp variety. As the forests were felled, exotic varieties were planted to replace the diminishing forests. By the 1970s the bulk of logging in New Zealand was of non-indigenous trees. Native tree logging continued into the 1990s. However, the decreasing amount of indigenous forest left in New Zealand created concern that the native forests would be completely wiped out. This led to legislation in 1996 which prevents almost all indigenous logging in New Zealand. Consequently, certain physical environments are no longer part of the logging scene of New Zealand. However, the influence of indigenous logging remains in the industry. Indigenous trees were often very large, entangled with vines and growing amongst many smaller trees. They are less likely to be balanced than a plantation grown tree, and thus more difficult to fell. Harvesting operations provide challenges demanding different skills from the logger.

The current forests are planted largely in a single tree species, Monterey pine, which has been cultivated into a fast growing form known as *pinus radiata*. It has a growing span from seedling to millable tree of between 20 (in the Far North) and 30 years (in the least favourable conditions in the South Island). Trees are grown in plantations varying in size from less than a hectare, to one of the largest manmade forests in the world: Kaingaroa, which is over 180,000 hectares. The trees are a softwood variety, generally planted at even spaces in rows, to facilitate tending and harvesting. Trees may reach a height of up to 40 metres before they are

felled. There is relatively little growth beneath these trees if planted in close rows, though understorey vegetation is present in more widely spaced plantations.

The physical environment

New Zealand has a varied landscape, with forests either planted or growing naturally on most types of terrain. The 1920s large scale plantings (of introduced or ‘exotic’ species, e.g. Monterey pine) on the Central Plateau (a large region in the central North Island), were on land underused for pastoral farming because of soil deficiencies. Vast tracts were planted around Rotorua, the major centre of the region (Poole, 1969). Because New Zealand forest harvesting is now almost exclusively exotic (even more specifically *pinus radiata* dominant), Rotorua is considered the centre of the logging industry. Consequently the Central Plateau was included in the present study. Other areas have substantial forests planted, though not so extensively as the Central Plateau. These include the Far North (the most northern part of the northern peninsula of the North Island) and Manawatu/Hawkes Bay (in the southern part of the North Island). Both are regions investigated in the current study. The location, landscape, climate and infrastructures of each area have impacts on logging operations, and it is important that these are placed as a context for the present study. Justification for selecting the three areas is detailed in the method chapter.

The following is a general description of each of the regions’ physical characteristics, including soils, terrain, climate and infrastructures. It is important to note that while generalisations do need to be made to give the reader an overview of each region, nevertheless there remain multiple variations from one work site to another. For example, rainfall in the Far North can be twice as much per annum between two locations within twenty kilometres of each other.

The Regions

The Far North

The Far North has sand dunes on the Aupouri Peninsula, where large areas of *pinus radiata* were established as part of land stabilisation and as an employment scheme in the 1960s and 1970s. The soil is free draining and usually on flat terrain. The Far North has unpredictable weather, but wet conditions occur regularly, mainly in winter. The warm, though wet, winters are favourable for loggers working on the sand country. Planting in these areas, however, has largely ceased because of the poor soils. Recent planting has been on land marginal for

pastoral farming. It is generally steep and dissected by gullies, with clay soils that are extremely slippery when wet. The clay provides a good medium for growing *pinus radiata*, but not for the harvesting of it. The contrast between the flat dune land and other terrain is sharp. Heavy rain on the sand does not cause much difficulty for logging operations, although it causes excessive wear on moving parts in machinery. Conversely the heavy rains on clay soil slow work down through the accumulation of sticky clay on boots, clothing, wheels, tracks, saws and other equipment. It is difficult to move machines in the wet weather, and at times is so dangerous and difficult that logging is impossible.

The Central Plateau

The Central Plateau has a large area of pumice (volcanic) based soil. While not as free draining or conducive to easy movement as sand, winter work is not badly affected by wet conditions. Some areas within the greater Central Plateau have soils which can become slippery and sometimes unworkable in wet weather, but it does not cling to machinery to the same extent as the very viscous clays of the Far North. Fertility is sufficient to sustain good tree growth. Large areas have relatively easy terrain so that ground based loggers can operate most of the year. The concentration of forestry in this region means hauler operations are viable, enabling work in conditions which might prevent 'ground based' logging (using wheeled and tracked machinery, as opposed to 'hauler based' operations, which use cables to move the logs). Rainfall can be high, especially near the ranges during the winter, and it is colder than the north. Companies can anticipate wet conditions and move crews to free-draining soils in the wet. The size of the company operations gives the flexibility to do this, where it would not be an option with a smaller forest owner.

Manawatu/Southern Hawkes Bay

Sand dunes occupy large sections of the western coast of this region. Conditions there are similar to those on the northern dunes. Most of the dune forests were planted in the 1950s and 1960s but some planting continues there. Recently, more forest has been planted on siltstone (papa). Terrain is often steep and fractured by gullies and bluffs. Other planted areas are less steep and less difficult to log. Rainfall is much greater in the west, causing some difficulties in the winter. The lower rainfall in the east makes conditions conducive to winter logging, but less suitable for tree growth.

Wind and heat

All three regions experience high winds. This can cause windthrow: trees blown over. Windthrown trees are under extreme tension, through being tangled and pressured by other fallen trees. Logging such trees is exceedingly dangerous for loggers. Wind can be extremely troublesome in the hill country, as, funnelling through valleys, it picks up speed. Changes in wind direction are common and the swirling action can make felling difficult.

In summer, by the middle of the day heat can be so intense that work has to cease. As an area is felled and exposed to the sun, heat builds up in the sheltered pocket. Heat stress and subsequent fatigue bring the potential for danger.

General Trends

Overall, the trend in forest planting is towards the steeper areas of both islands. While it is preferable to plant on easily accessible land to facilitate harvesting, other factors enter the equation. Land which is marginal for pastoral farming is the main source of new forest land. Generally, cheap land is purchased for forest planting, and this is almost always steep. It is also preferable to plant in areas with high rainfall. Land closer to the ranges generally has greater rainfall and is likely to be hilly. Badly eroded land is less able to support pastoral farming, and this, too, is most often in the steeper, wetter areas.

Weather is a crucial factor in successful forestry. Forestry developers are increasingly seeking out areas where climate is favourable. The belt of hill country in the Far North exemplifies this. The soil type is good, the rainfall high, and the climate very conducive to high growth rate of *pinus radiata*. However the terrain is generally steep and dangerous for logging. There has been a rapid increase in planting in this area in the last few years. Areas which facilitate easy harvesting, such as the sand country are, now less likely to attract planting schemes, because the poor soil and drier conditions make the final product poorer both in quality and quantity. Land being planted is rarely both flat and of good soil quality.

The heavy rainfall and steepness make hauler logging more appropriate than ground based operations because heavy machinery moving around in wet conditions churns up the soil and makes roading and access difficult. It can also lead to erosion, which risks breaching the Resource Management Act (RMA). Because cable harvesting has less impact on the landscape, it is likely to become a desirable option, especially as the new hill country forest

blocks come on stream. However, hauler logging is only an option when blocks are sufficiently large to justify the setting up process required with cable hauling.

Difficult conditions are likely to be more common as more and more planting is carried out by farmers, small block owners, and through superannuation schemes. It is anticipated that smaller block owners and private schemes will make up the largest percentage of forestry by the year 2010 (Fielder, 1997a).

Infrastructures

The Central Plateau

The infrastructures required for logging begin at the felling face and finish either at the mill or the port. The Central Plateau, established now for more than sixty years as a forest region, has considerable services and facilities. The main centres are Rotorua, Taupo and Tokoroa. There are vast tracts of land with low population density, and most people live in and around the big towns. The two main ports, at Napier and Tauranga, have been upgraded to facilitate log storage and loading. Roads to Napier and Tauranga were greatly improved to allow rapid transit of logs from the Central Plateau to the port.

Roading is highly oriented to logging and forestry throughout the entire region. Internal access roads within the large tracts of forest are highly developed and extensive. Most main routes in the area are well metalled if not sealed, providing all weather access.

The headquarters of the two big companies, Fletcher Challenge and Carter Holt Harvey are situated in the Central Plateau. Company administration staff, supervisors, trainers, and planners facilitate the running of the forests involving clearing, planting, pruning, thinning and harvesting. Road maintenance crews, fire crews, and other general staff allow a sophisticated system to operate. The companies are large and have extensive chains of production from planting the forests right through to processing plants and retail chains for sales.

The big companies dominate the Central Plateau to the point where such infrastructures are the rule. The towns and cities of Rotorua, Tauranga, Whakatane, and Taupo are strongly influenced by forestry, while Kawerau and Tokoroa are dominated by the forest industry. Machinery, engineering, and safety equipment companies exist in significant numbers. Facilities such as the Forest Research Institute (FRI) and the Logging Industry Research

Organisation (LIRO) emphasise the forest atmosphere. The strong presence of forestry has also enabled the development of the Logging and Forest Industry Training Board (LFITB) and the local forestry course at the polytechs. Occupational Safety and Health (OSH) has the chief bush inspector in its Rotorua office.

Much of the initial infrastructure in the forests was either built up by the New Zealand Forest Service (NZFS), which developed most of the Kaingaroa Forest, or rode on its financial back. NZFS was a government department dedicated to planting for the country's future development and also to providing employment for an unskilled workforce (Poole, 1969). Economic profitability was not an overriding issue in the development of that infrastructure (Colin Sutherland, January 14th, 1996, personal communication). It is unlikely that private enterprise would have invested in such an extensive scheme. It is also unlikely that sufficient funds would have been available to allow the growth of LFITB or LIRO. Current trends indicate that the big companies which have purchased the New Zealand Forest Service forests will be less dominant in the development of future forest schemes and will be more interested in buying timber at point of harvesting. Any infrastructure development may be less planned and more haphazard and market oriented. Because the large Central Plateau infrastructure is already in place it is likely to continue to grow, but in areas with a more recent history in forestry, growth of supporting systems which could facilitate forest development are less predictable.

The Far North

In the Far North Kaitia (population 5000), is the main centre, about 150 kms from the nearest city, Whangarei (population 55,000). Kaitia has only a very small industry base and is essentially a farming service centre. Geographic isolation from the rest of NZ affects the Far North. Within the region, twisting gravel roads and low population density make small communities isolated even from Kaitia.

Infrastructures in the Far North are limited. Logging has only just begun in the biggest forest, Aupouri, and no major engineering or machinery companies exist there. Only one company has an administrative base, and that company is the only one with a processing facility in the area. Most of the other wood is shipped to mills to the south or to Marsden Point Port. Roding is poor and undeveloped in much of the region. The Number One State Highway winds over a mountain range. The nearest rail facilities are more than 80 kms to the south.

Kaitia has not yet developed a logging orientation, although the new Triboard mill has given some impetus to forest related industry.

In the past, the Far North had a strong NZFS presence both at Aupouri north of Kaitia, in Mangamuka/Omahuta and in Kaikohe, where a large bureaucracy provided co-ordination for forest schemes in the upper Northland area. Most of this organisation has gone. There is a small office for the Ministry of Forestry in Whangarei, which serves the whole of Northland. Much of the training in the Far North comes via courses through training providers such as trusts. LFITB maintains an agent in the region, based at Whangarei, who provides assessment of training. He also helps to run the Forest Industry Training Action Group (FITAG), an organisation which promotes training locally. The OSH bush inspector is based in Kerikeri, some 70km to the south.

Manawatu\Southern Hawkes Bay

In the Manawatu\Southern Hawkes Bay, there are varying degrees of isolation from forestry infrastructures. Southern Hawkes Bay contains plantings which are considerable distances from Napier/Hastings (neighbouring cities, total population 110,000) to the north or Masterton (city of 22,000) to the south. Napier and Wellington (capital city of 350,000 population) provide port facilities. The Napier port is easily accessible on good roads. Major roads into Wellington are satisfactory. Rail in these regions is fairly well developed and enables easy transportation to the ports and throughout the region. Many of the back roads in areas where the forests are being planted are winding and unsealed and not built to handle large heavy vehicles.

There are company structures in place in Napier, Masterton, Wanganui (city of 40,000 population) and Manawatu (a region of 120,000 including the city of Palmerston North, population 75,000), with mills and processing plants (but much less extensive than those on the Central Plateau). These areas once had Ministry of Forestry regional operations, but they have been disbanded. Ministry of Forestry facilities are now available in Wellington.

There are some engineering and machinery related industry in some centres but they do not have the same orientation to forestry as those in the Central Plateau. Because harvesting in the region is still in its infancy, it will take time for such support services to emerge. Moreover,

because the area is reasonably close to the Central Plateau, contractors and companies from the Manawatu\Southern Hawkes Bay are still inclined to rely on services in that area.

In Napier/Hastings, Masterton, Palmerston North and Wanganui there are institutions which provide training along the lines prescribed by LFITB. Masterton, Palmerston North and Hastings have polytechnics which have established forestry courses. Many crews now recruit students once they have graduated from the year long courses, allowing contractors to employ workers who need no further formal training.

Summary

The different physical conditions of the three regions present different circumstances in which logging crews operate. These differences affect the economic viability of logging, which varies from one region to another, and also between crews within regions. Increasing the differences are the contrasting levels of infrastructure in place. These infrastructures, evolving over time, help to determine the sort of logging which takes place and also the sort of loggers who contract to harvest the trees. From such differences emerge crew cultures which impact on training, safety, and the general functioning of each crew.

The following chapter reviews the accident literature.

Chapter Four

Literature Review

Accident literature

Accident research has involved development of theory about accident causation, linking particular factors and associated accidents and also investigating wider links. It has been used as well to develop methods for reducing accidents and promoting safety. Because workplace accidents are undesirable, there is an emphasis in the field of research on finding methods and systems for reducing their occurrence. The strong emphasis given to prevention in accident research has meant that often theory development, methods for accident reduction, and safety promotion are inextricably entwined.

Theories range from the general, such as epidemiology, which identifies broad patterns, to the specific, such as ergonomic and behavioural explanations which investigate the way that particular factors may increase or decrease accidents. Much of the research in both the latter approaches investigates prevention of accidents and links this to theory. Research has also looked at issues such as risk and error, developing theory and prevention measures from these. This review will begin with a brief look at epidemiological work which has recently taken place in New Zealand logging, since the results from the epidemiological study of Kawachi et al. (1991) were instrumental in initiating the present study. This will be followed by discussion on developments in accident research and theory with an emphasis on research which has relevance to New Zealand logging. Figure 1 presents a diagram of different areas of accident causation, prevention and safety which will be discussed in this review.



Figure 1: Accident causation, prevention and safety promotion.

Epidemiological Approaches

Epidemiology identifies patterns of incidence, prevalence, and distribution of accidents and other health issues (Gloss & Wardle, 1984). Accident related epidemiological research investigates the relationship between the person, the environment and the ‘agent’. The latter is generally perceived of as an energy exchange that produces accidents. Epidemiology classifies groups by etiologically common factors and suggests hypotheses to reduce accidents through programmes and systems specifically designed to control factors thought to produce the accidents. In epidemiology "injuries and damage are measurable indices of the accident, but the accident itself is the unexpected, unavoidable, and unintentional act resulting from the interaction of the victims of the injury or damage deliverer and the environmental factors within situations which involve risk taking and perceptions of danger" (Heinrich, et al., 1980, p 50).

Epidemiology is particularly useful for identifying patterns which give indications of what might be occurring. It thus provides a path to follow in developing further understanding of accident causation. Moreover, in the absence of any reliable theory of accident causation, epidemiological studies provide directions for safety programmes based on the evidence uncovered by the statistics of accidents. The large epidemiological study conducted by Kawachi et al. (1991), which investigated the occurrence of injury among forest workers in New Zealand, was one such piece of research. These authors found no clear patterns for fatality or injury, but significant logger hospitalisations during the late 1970s and most of the 1980s. Younger loggers appeared to be at the highest risk. They found that tree felling was the greatest contributor to death and that chainsaw injuries the most common type of serious injury. They also noted the low average age of loggers. While findings suggested that there had been some reduction in serious injuries in the three years ending 1988, fatalities had not declined. Kawachi et al. suggested that most of the reductions in injury had resulted from improved protective equipment, better logging techniques, and possibly new standards of training and certification. However, OSH claims that the decline in injury did not continue during the 1990s, and, moreover, fatalities remained at high levels (Bell, 1998).

One of the drawbacks of the epidemiological approach is that in averaging data from large numbers, blurring of variations can result. For instance Kawachi et al. (1991) presented overall figures of New Zealand forest workers' accident rates which tended to submerge the vast variation of the logging workforce. Andersson, Johansson, Linden, Svanstrom and Svanstrom (1978) contend that the epidemiological approach does not lend itself to investigating causal patterns and processes. Slappendel (1995b) notes too, that the method does not allow a depth of insight into the processes and mechanisms which contribute to injuries. Nor does it allow any understanding of the resulting change of those processes after the fact. However, those patterns which emerge pose questions, and as a consequence of their conclusions, Kawachi et al. suggested a need for the investigation of human factors which might contribute to the accident process. It is important to understand the development of accident research to appreciate the emphasis which has been given to particular human factors in New Zealand logging research.

Early research and accident proneness

The first scientific studies of occupational accidents were carried out by Greenwood, Woods, Newbold, and Yule, between 1918 and 1926 (McKenna, 1983; Mohr & Clemmer, 1988;

Osborne, 1987; Saari, 1990). They were based on the assumption that accidents have causes and can thus be prevented, that prevention depends on whether or not there is sufficient knowledge of the specific accident, and that worker failure is the main cause of accidents. The primary focus of the research was to discover factors which could be applied to the promotion of safety. This appears to have given an emphasis to the practical side of accident research rather than the development of theory. That focus has continued to the present in many accident studies (Jarl, 1980; Quinlan & Bohle, 1991).

The notion of 'accident proneness' derived from this early research was first introduced by Farmer and Chambers (Gibson, 1994b; Osborne, 1995). They concluded that accident proneness was a trait, which they measured using personality tests with accident-repeater and accident-free groups. They believed that since people exposed to hazards seemed to differ in accident experience, some must have a greater propensity for accidents than others (Glendon & McKenna, 1995). This notion prevailed in accident theory through the first part of the century (Glendon & McKenna, 1995) despite there being little empirical evidence to support the theory (Hale & Glendon, 1987). A great deal of accident research since those first writings of Greenwood and his colleagues has focused on blaming the victim by attempting to identify accident proneness traits. This has been coupled with the notion that workers who have accidents are ignorant, careless, malingering, or that they deliberately perpetrate accidents (for instance, in the culture of masculinity) (Hopkins, 1995). Pre-eminent amongst the earliest researchers was Heinrich, who developed a theory of accident causation based on work in factories in the US.

The Domino Theory

The focus on individuals who are likely to experience accidents was clearly articulated by Heinrich in 1931 in the Domino Theory. Heinrich maintained that there was a five factor preventable accident sequence. These were likened to domino blocks (Heinrich, et al., 1980). The sequence was:

- 1) Genetically or socially derived traits such as recklessness, stubbornness, and avariciousness (i.e. a propensity for accident proneness).
- 2) A fault of the person: the inherited or acquired faults "constitute proximate causes for committing unsafe acts" (p. 22).
- 3) An unsafe act and/or mechanical or physical hazards.
- 4) The accident itself.

5) Any injury sustained.

Heinrich (1959) contended that the key to accident prevention was “the bull's-eye target in the middle of the sequence - an unsafe act of a person or a mechanical or physical hazard” (p. 22). By reducing the likelihood of an unsafe act he suggested that even if the first two dominoes fell, there would be no accident. He asserted that 88% of all accidents were caused by human error. Slappendel (1995b) notes that the Domino Theory is a model describing discrete causes rather than one which links all causal factors holistically. She suggests Heinrich may have been pragmatic, more interested in accident prevention than the development of a comprehensive theory.

It has been suggested that Heinrich was too focused on the unsafe behaviour of individuals (e.g. Gibson, 1994a; Quinlan & Bohle, 1991). While he identified genetic and social learning as keys to subsequent accidents, in later writings he did promote ongoing modification of his theory. For instance, when Bird suggested that the lack of control brought about by poor programmes, poor standards and inadequate compliance were the first factors in the accident sequence and must be addressed, Heinrich acknowledged that management did play a part in accident causation (Heinrich, et al., 1980). Edward Adams developed the Domino Theory further by emphasising that employee behaviour and work conditions were strongly influenced by operational errors made by managers and supervisors. Weaver added the notion that operational errors resulted in myriad unplanned and often undesired effects and that some accidents were symptoms of those errors. These suggestions were incorporated into Heinrich's subsequent writings (Heinrich, et al., 1980). More recently the principles within the Domino Theory have served as the basis for a broader approach to accident prevention, looking at multiple causation. Examples of these are monitoring and supervision of equipment, behaviour and training (Osborne, 1995).

Accident theory continues to develop and take on a broader approach, albeit still with some emphasis on the immediacy of the workplace and the specific accident. On the other hand many health and safety practitioners maintain a focus on the 'unsafe act'. This may be because it is the easiest and most direct way to investigate and possibly prevent an accident. Perhaps it is because of the pragmatism of the theory that it remains of such importance in the field of accident causation (Gloss & Wardle, 1984).

Some studies have continued to focus on accident proneness. Boyle (1980), for example, used a natural experimental situation to establish that some workers were more accident prone than others. Mayer, Jones and Laughery (1987) found that a small percentage of employees had a large proportion of the total accidents in organisations. Repeat accidents from this group were more than would be predicted by chance. Porter and Corlett (1989) maintained that participants identifying themselves as accident-prone performed poorly on many tasks. They concluded that the "...accident proneness trait is a continuum with non-accident prones at one end and accident prones at the other. Accident proneness, as measured by the APQ [Accident Proneness Questionnaire], appears to be a stable trait for periods of at least 18 months" (p.330). In support of the assertion that accident proneness is a trait, Boye, Slora and Britton (1990) noted that there was stability in safety attitudes, indicating individuals with higher accident risk could be identified. However, Mohr and Clemmer (1988) countered that accident proneness may actually be a transient trait rather than a permanent one. They qualified these findings by suggesting that studies should take account of the possibility that some people may avoid dangerous occupations. This has relevance to logging because research suggests that certain types of people are more inclined to do such work than others (Gibson, 1994b).

The focus on error and unsafe acts implies that critical to risk taking activity is that certain people have characteristics which impact on the likelihood of accidents occurring. These may be either traits or learned behaviour.

Personality and characteristics

In an attempt to identify reasons for accident proneness, research has investigated characteristics of people and the association of these with accidents rates. Almost invariably personality is measured via a scale. Shaw and Sichel (1971) were among the first to use personality tests to assess accident related traits. They used the Eysenck Personality Inventory to compare personality profiles of groups with accident records and found links with extroversion. Other researchers linked accident proneness to nervousness, over-reaction, recklessness, excitement seeking, lack of confidence, and over-arousal (Chappelow, 1989), social maladjustment and distractibility (Hansen, 1989), and aggression, anxiety, extroversion and sensation seeking (Glendon & McKenna, 1995). Sah, (1989) reported in his research that personality factors such as extroversion, locus of control, impulsivity, aggression and neuroses were related to accident rates. There is a diverse range of scales and

measures for determining personality type related to risk taking. For example Flodmark and Aase (1992) used the Bortner questionnaire. Other scales have been developed to measure personality traits which include accident proneness related factors (e.g. The Minnesota Multiphasic Personality Inventory, Spielberger's State-trait Personality Inventory).

Some studies have suggested certain personality types seek particular types of work. Spector and O'Connell (1994) and Hurrell (1985) found that people with type A personalities tend to gravitate to stressful jobs. When these are blue collar jobs, there is a higher likelihood of risk. Flodmark and Aase (1992) found that blue collar workers, identified with type A behaviour, had higher levels of musculoskeletal complaints than those without. 'Type A's' show more symptoms that have been associated with accidents (Hurrell, 1985). There has also been evidence to suggest that personality types may be linked to certain accident related behaviour. Type A persons are purported to ignore fatigue and disabling symptoms in order to keep working. They also tend to behave more impatiently and irritably (Carver, Coleman & Glass, 1976 ; Flodmark & Aase, 1992).

There is considerable disagreement about what a type A personality is and what association there is between type A and other personality characteristics. Additionally the definition of groups who exhibit greater levels of a certain type of trait are in dispute (Flodmark & Aase, 1992). Whether type A and other 'personality types' are anything more than classifications of people, based on their behaviours, or there is a more physiological base, has not been established. Little or no physiological evidence is offered to give weight to the scales. Some studies (e.g. Melamed, Luz, Najenson, Jucha & Green, 1989) have used measures of somatic complaints, ambulatory heart rate, and cardiovascular disease as adjuncts to personality measures but this does not establish any inherent traits which indicate personality type nor any link between accidents and trait. Connections between physiological performance and 'accident prone' measures are limited to motor responses, such as visual motor and blind reach tasks (Porter & Corlett, 1989). Hale and Hale (1972) suggested that rather than there being stable personality types, there may be links between age and certain measurable behaviours such as inattention, indiscipline, impulsiveness, recklessness, and misjudgement.

Not all studies have found a relationship between accidents and personality characteristics. Hansen (1989) used scales which measured type A related variables (maladjustment, cognitive ability, distractibility) and found little to indicate that there was any link between these and accidents. He did note a complexity of interaction between 'hard' variables such as hand eye co-

ordination, reaction time and visual acuity, and 'soft' variables such as distractibility. He suggested a causal model would be difficult to construct but contends that it might reveal important interactions. He does not attempt to explain how it would take into account all the variables which exist within a workplace culture such as logging. However, he admitted it would be applicable to a limited range of settings. Nevertheless research continues to rely on personality measurements to ascertain whether there is a link between personality characteristics and accidents (e.g. Aberg & Rimmo, 1998; Bernard, Sauter, Fine, Petersen, & Hales, 1994; de Zwart, Broersen, van der Beek, Frings-Dresen, & van Dijk, 1997; Jonah, 1997).

Age has been given special attention as many researchers have suggested evidence indicates is a link between age and workplace accidents (Aurma, Hakola, Torbjorn & Jarmo, 1994; Bennett & Passmore, 1984; de Zwart, et al., 1997; Frone, 1998; Hansen, 1989; Laflamme & Menckel, 1995; Poschen, 1998a; Rutter, Quine & Chesham, 1992; Van Zelst, 1954). Bustini (1988) did find that the highest risk group was under 20 years old and the lowest between 30 and 39. However, he maintained that experience was a better indicator of risk than age. Often factors such as age and experience are entwined so it is not clear whether a single risk factor can be identified. Many studies have made only weak links and have looked at age in isolation (Hansen, 1989), rather than attempting to ensure other factors, such as work place activity, are accounted for or included as additional variables in their studies (e.g. Hasselback & Neutel, 1990).

Gender has also been given attention in the research. Dillingham (1981) found that males tended to have more accidents. However, his study did not clearly separate gender and work type, or situation. His findings were supported by Weiss, (1991) who noted that males had twice the risk acceptance as women. Conversely, Dillingham found an uneven distribution of gender across occupations, and this accounted for much of the difference. This was emphasised by Landen and Hendricks, (1992) who noted a different distribution of age related accidents for women and men. Reason (1990) and Reason and Lucas (1984) claimed there was no gender difference in accident levels when all variables were allowed for. Levenson, Hirschfield and Hirschfield (1980) suggested that gender accident rates were often confounded by the differences in behaviour between men and women when faced with danger and also the tasks they were assigned within jobs. This was supported by Spillman (1988) who found that men were more resistant to workplace safety promotion than women.

Other variables such as health (Frone, 1998), social maladjustment (Hansen, 1989), work group size (Guastello & Guastello, 1987), risk taking (Dwyer, 1983; Frone, 1998), and demographic patterns (Cone, Harrison, & Dupont, 1990; Frone, 1998; Stout, et al., 1996), ability to absorb stress (Spector & O'Connell, 1994), educational level and mental ability (Ferguson, McNally, & Booth, 1984) have been linked to accident rates. One criticism of most such studies is that they are cross-sectional and fail to capture change (Spector & O'Connell, 1994). Results vary from one occupation to the next, from one situation to the next and few studies appear to have allowed for confounding variables.

Opposition to Accident Proneness Beliefs

Other research contests the validity of accident proneness and 'unsafe act' studies. Verhaegen (1993) found that jobs which could be done in a variety of ways have a higher level of accidents, which he claims explains different accident rates better than any traits. Porter (1988) reviewed the notion of accident proneness and concluded that poor attention was the only identifiable 'trait' which could act as a predictor. The only other predictor of note was the experience of a recent major life event, and this does not qualify as an inherent or even learned trait. Leigh (1986) concluded that the demographic variables measured in many studies, such as race, marital status, gender, age, education achieved, score in mental exams, and divorce experience, were rendered insignificant when job related variables were included. He found that when these were included in regression analyses, job characteristics were better predictors of industrial accidents than personal characteristics. Leigh's study emphasises that any findings which ignore the more complex interactions and processes of the workplace, should be treated with caution.

The conceptualisation of accident proneness was questioned by McKenna (1983) who suggested it would be useful to discard the term and replace it with a term such as 'differential accident involvement'. Nevertheless, because of unacceptably high accident levels in many workplaces, the focus of research has remained on reducing accidents through education, enforcement and the use of engineering and technological advance (Stout et al 1996). This implies a continued acceptance of Heinrich's (1959) belief that accidents are largely due to events immediately related to the accident.

New Zealand and accident proneness

Slappendel (1995b) noted that the Domino Theory has had an important influence on perceptions of accident causation as well as accident prevention in New Zealand. She referred to the use of the Domino Theory in the National Safety Association of New Zealand's (NSA) courses and diplomas. Companies such as New Zealand Forest Products used this system of training with their safety officers which perhaps explains their emphasis on unsafe acts committed by individuals. She maintained that the notions of unsafe acts and unsafe conditions have had a lasting impact on accident investigation. Even in the 1990s, bush inspectors reported on accidents under the headings 'Unsafe act' and 'Unsafe condition'.

Not only do bush inspectors adhere to the Domino Theory in its simplest form but management also tends to attribute accidents to worker behaviour and the immediate contingencies surrounding the accident. Workers are more inclined to attribute accidents to external causes (Gibson, 1994b; Lacroix & Dejoy, 1989). Gibson, in a study of loggers, found that most workers claimed production pressure overrode safety concerns, while only 8% of management felt this was important. As Dwyer (1991) suggests, it is not surprising that theory development has remained fixed on unsafe acts because employers have more say in the development of accident prevention initiatives, and are more likely to commission and direct research. This employer-driven emphasis is apparent in New Zealand logging research and accident prevention (Rowse, 1997).

Notwithstanding the arguments for and against particular characteristics being accident indicators, there is reasonable evidence to suggest that individual behaviour is a major contributor to accidents (Feyer & Williamson, 1990; Hale & Glendon, 1987; Salminen & Tallberg, 1996). It remains debatable to what extent this is attributable to stable traits or learning behaviour and associated error.

Error

Reason (1990) suggests that error and violation may not be differentiated in some accident causation inquiry. Reason maintains that violation implies intention, and error implies mistake or lapse. It is important to distinguish between the two. Solutions to error come through improving skill and concentration, while to reduce violation, consideration must be given to changing systems and social structures which may encourage violation.

Rasmussen (1982) sets out three levels of error: skill-based slips and lapses, rule based mistakes, and knowledge based mistakes. Most slips and lapses take place with little or no conscious control. They come from breakdown of automatic patterns of behaviour. Rule based mistakes are generated when learned rules are not used, or they are unsuited to the situation. Knowledge based mistakes come from inadequate or inappropriate use of problem solving skills.

Skill based lapses

Skills are learned through repetition of appropriate motor responses. Understanding of how to achieve these may come through trial and error or through instruction and practice. Rasmussen (1982) says these will become more and more automatic as they are performed so that provided they are appropriate for the task at hand, no errors will be made using them. However, there can be slips in skill or lapses. These may be the result of cognitive deficit or physical dysfunction, and sometimes inadequate learning. They may occur because of fatigue as was noted by Kirk (1996) in a study of New Zealand loggers, or because concentration has been interfered with through an emotional change, such as anger or frustration (Cole, Grubb, Sauter, Swanson, & Lawless 1997). They may also occur because routine and boredom lower awareness of danger so that when an unexpected incident arises, the person is not prepared. Such occurrences have been noted amongst workers in other industries (Fischhoff, Furby & Gregory, 1987). A workplace with an unpredictable environment is less controllable than a factory, and is more difficult to guard against danger.

Skill based errors may also occur because of a person's inability to perform a task. The issue of whether a person is ill trained or inherently incapable of performing without some error is a matter of dispute. Some researchers suggest that cognitive and physical deficiency are significant reasons for error (e.g. Hansen, 1989; Reason, 1990; Rasmussen, 1982, 1997; Wagenaar & Groeneweg 1987). Other research claims that training can reduce almost all error if it is systematic and focused on safety (Garland, 1990a, 1990b, 1990c, 1996; Hale, 1984; Poschen, 1998b). Such claims appear to assume comprehensive training which has the support of management and is conducted in positive circumstances. Komaki, Heinzmann, and Lawson, (1980) suggest that training per se is insufficient, contending that without ongoing feedback and maintenance, training can be rendered ineffectual. Likewise Ray and Bishop (1995) state that organisational circumstances in workplaces can make the difference between success and failure in a training programme.

Rule based mistakes

Trained workers have a set of rules which enable them to respond to each problem encountered in most predictable situations. New rules may be developed as experience presents new problems and new solutions. Rasmussen (1987) notes that these rules do not necessarily require training. A worker may develop them through trial and error and observational learning. The contentions of Komaki et al. (1980) and Ray and Bishop (1995) that training alone is insufficient for reducing accidents, apply to rule based training as well. Moreover Reason (1990) notes that 'troubleshooting rules' may not match the 'environmental signs'. At that point a person must move to a conceptual level where behaviour becomes goal controlled and based on knowledge and problem solving skills. Just as acquiring automatic skills requires a learning process so rules which apply to particular situations must be learned.

Knowledge based mistakes

At the knowledge based level, learning involves not only the accumulation of information but the acquiring of the skills necessary to interpret that information and develop solutions (Rasmussen, 1982). Learning develops primarily through feedback and adjustment. It depends on whether a worker can recognise when his skill and rule based repertoire is inappropriate or insufficient for the particular circumstances, and use strategies to carefully assess the unfamiliar problem and develop a strategy to solve it.

Reason (1990) points out that when "the problem space is in largely uncharted territory, it is less easy to specify in advance the shortcuts that might be taken in error" (p. 57). In such circumstances, time and caution are required to assess the problem and develop possible solutions. However, time may be restricted, safety not always a priority, and resources for teaching complex problem solving not often available.

Training

There is disagreement about the effectiveness of training in reducing occupational injury (Johnston, Cattledge & Collins, 1994). Hale (1984) notes that there is little evidence in the literature to suggest it is either effective or ineffective. Bennett and Passmore (1984) claim that most data on training is inadequate and results are most often anecdotal. Johnston et al. state that while there is evidence which shows many workers who are injured have received no safety training, the quality and extent of the training of others in those workplaces was not

clear. Those authors maintain that it is particularly difficult to assess training from one workplace to another, and to differentiate between carefully guided training, and incidental or observational learning.

On the other hand, some research suggests that training can have an important effect on safety. Dammerud (1989) investigated safety training in forestry and claimed accident levels were markedly reduced after training had been instigated. In New Zealand, managers of company forests were found to give considerable credibility to the Forest Industry Record of Skills (FIRS) training modules and the impact they had on safety (Vitalis et al., 1986). In support of this Probine, et al., (1987) maintained that poorly trained or untrained workers were a danger not only to themselves but also to those with whom they worked. This also supports Evan's (1984) research which found that by training workers to take care of equipment and to use it correctly, productivity was improved and risk reduced.

When assessing training programmes, researchers often focus on the mediating factors surrounding the training as much as the training itself. Marx (1982) notes that organisational factors such as lack of management commitment to training, and lack of administrative support, may result in poor feedback and poor reinforcement of skills. Dedobbeleer and German (1987) claim that there is not a clear and distinct relationship between training and injury. They suggest that worker motivation, attitudes, relevance of the training to the job and comfort may all contribute to transfer of training. More recent research suggests that where job performance, training, and assessment are integrated within the workplace in conjunction with staff co-operation, there is an impact on safety levels (Weidner, Gotsch, Delnevo, Newman & McDonald, 1998). Wagenaar and Groeneweg (1987) maintain that accident causes result from a combination of lack of training, lack of attention, unsuitable personality, wrong habits and poor ability to diagnose problems. It is thus difficult to ascertain the role that training plays amongst other variables and it may be inappropriate to separate training from other workplace systems.

Johnston et al. (1994) found in a review of literature on successful training programmes that there were four common characteristics: needs assessment, programme development, goal setting, and knowledge of results through feedback. These findings typify the focus the literature has on training programmes in large businesses, where resources are available to sustain such requirements. There is little focus on small work organisations. Nevertheless

there is evidence that feedback and maintenance are critical to any long term success in training programmes (Komaki et al., 1980).

Even when training is well designed there may be no structures in place to ensure the stated intentions of the training programme are fulfilled. Employers may talk about the need to train but often fail to admit that time constraints, inadequate facilities and production pressure hinder training (McDermott & Beurger, 1991). In support of this Johnston et al. (1994) noted that reviews of training showed that low accident companies usually provided more opportunity for specialised safety training, more instruction, and guidance from supervisors, and used lead workers rather than supervisors to train newcomers.

There is limited research on the efficacy of training in New Zealand logging (Groome, 1979; Fielder 1997a, Gibson, 1994b) and results are equivocal (despite what forestry managers might suggest [Dammerud, 1989]). One of the few studies of New Zealand loggers which compared FIRS trained and untrained fellers found no difference between their accident rates (Fielder, 1996c). Gibson notes that because the industry is so diverse and training so difficult to measure it may be impossible to determine the effectiveness of training for reducing accidents in New Zealand logging (R. Gibson, 5th December, 1995, personal communication).

While there have been few studies into logging safety training in New Zealand there has been considerable ergonomic research conducted.

The technical/ergonomic approach

Ergonomics, which was developed in Europe, encouraged close consultation between management and workers, and the emancipation of workers from the industrial capitalist system. It was originally an holistic approach, working towards designing a safer, more comfortable and productive environment, benefiting both employers and workers. In France this was assisted by a strong communist influence in the post-war government. However, in the US and Britain a capitalist orientation emerged and a hands off approach to the social and worker oriented issues led to the present narrow, technocrat-type focus on accident causation and prevention (Quinlan & Bohle, 1991).

Laflamme (1990) maintains that ergonomics looks at how the individual, the task and the environment interact, and seeks to analyse the disturbances in systems. The primary concern of the current ergonomic/technical approach is to maximise the fit between the operator and the environment, equipment and methods used, and to investigate ways to constantly improve those fits (Kirk, 1996; Osborne, 1995; Quinlan & Bohle, 1991). Heinrich advocated the development of devices and techniques which would remove the human factor in accidents (Dwyer, 1991). Modern ergonomics has links to Heinrich's Domino Theory as it focuses on the relationship between physiology, equipment and the environment (Quinlan & Bohle, 1991).

The ergonomic approach now focuses on how to reduce accidents through adopting alternative methods and technology. Verhaegen (1993) claims that if a system is ergonomically designed, it dramatically reduces the significance of personality (in other words human error) in accident causation. Where accident research has been combined with the practical implementation of technological advances, there has been considerable progress. Reason (1995) maintains that because there have been so many advances in technology, particularly in regard to engineering related safety features, most accidents are now attributable to human error. It must be stressed that Reason here is referring to accidents which happen in controlled environments such as factories.

Safety engineers continue to suggest that ergonomics consider "the total physiological and psychological demands of the job upon the worker" (Gloss & Wardle, 1984, p. 146). However, while this may be the intention of ergonomics, it has been criticised for being too narrowly focused on technology. While ergonomic innovations may reduce accidents in some instances it does not address fundamental problems associated with management decisions or organisation. These too, can lead to such problems as occupational over-use syndrome, fatigue from production pressure, and other hazards created by work. Moreover, ergonomists generally fail to include social issues in their analysis of accident causation (Quinlan & Bohle, 1991).

Current Ergonomic Research in New Zealand

The investigation of single measurable factors (such as heart rate or development of protective equipment [Kirk, 1996; Kirk & Parker, 1992]) in ergonomic research is a trend exemplified in the accident research conducted by New Zealand's main forest research

organisation, the Logging Industry Research Organisation (LIRO). The majority of LIRO's research investigates immediate behaviours and equipment associated with accidents rather than wider issues such as production pressure or the levels of competition among crews. For example, recent research includes investigating job rotation, felling techniques and job exclusion in order to examine ways of improving production levels (Gellerstedt, 1997; Moore, 1989; Neumann & Gaskin, 1983; Parker, 1991; Parker, Cossens & Strang, 1993; Parker & Kirk, 1993; Sullman, 1995). Likewise the use of personal protective equipment is examined with the aim of eliminating or reducing hazards. For example, chainsaw trousers and protective boots are studied to reduce leg injury (Gaskin, 1986; Kirk & Parker, 1992; Kirk & Parker, 1993; Sullman, 1998), ear muffs to reduce hearing loss (Kirk, 1991), machinery designed to accommodate better body positioning (Gaskin & Smith, 1989), conspicuous colours to improve identification of fellow workers (Bradford, Isler, Kirk & Parker, 1992) and anti-vibration devices on chainsaws to reduce white finger (Gibson, 1994b). In each case there were indications of positive benefits from improved technology. Investigations of heart rate (Kirk, 1996), fluid intake (Kirk & Paterson, 1997), nutrition (Kirk, Gilbert & Darry, 1996; Sullman, Darry & Paterson, 1997) and physiological strain (Kirk & Parker, 1994) indicate the importance of physiological factors in safety. Environmental hazards such as flying debris (Parker & Kirk, 1993), and slippery steep ground (Kirk & Parker, 1992) have also been investigated in an effort to reduce accidents (Kirk, 1996; Kirk & Parker, 1994; Moore, 1989; Parker, 1991; Parker & Kirk, 1994; Tapp, Gaskin & Wallace, 1990).

Most of LIRO's research has a technocratic focus and is following the trends of other international ergonomic research. For example equipment design has been tested for accident reductions. Klen and Vayrynen (1983) studied safety equipment, Klen (1997) assessed personal protectors, Farkkila, Pyykko, Jantti, Aatola, Starck, and Korhonen (1988) studied the effects of vibration, Vayrynen and Ojanen (1983) and Vayrynen and Ojanen (1993) looked at personal protective equipment. The effects of physical stress are also investigated. Hagen, Vik, Myhr, Opsahl and Harms-Ringdahl (1993) assessed energy output and oxygen intake, Enander (1989) the effects of thermal stress and Vayrynen and Kononen (1991) investigated back problems. There have been studies to determine the effects of risky situations. Golsse and Rickards (1990) studied working near and with dangerous equipment and in dangerous environments; Laflamme and Cloutier (1988) investigated mechanisation

and risk; Bovenzi, Zadini, Franzinelli, and Borgogni (1991) and Hunter (1993), machine stability; and Hansson (1988) and Hansson (1990) investigated ergonomic design.

Blank, Laflamme and Andersson (1997) reviewed the literature on the impact that technology has had on industrial injuries. They concluded that while technology may have assisted in reduction of accidents, the methodology in many of the studies does not consider the conditions and moderating influences which may facilitate those favourable outcomes. Moreover, some of the studies reviewed, suggest that there can also be negative effects from technology introduction. For example, the introduction of the Davy lamp in the 1800s led to some miners feeling that their own intuitive sense of danger and thus their own power to decide what was dangerous, was being supplanted by management through a technological device (Dwyer, 1991).

Donald and Canter (1993) contend that following periods of improvement in accident levels there may be a plateauing of accident rates. They suggest there is a limit to achieving safety improvements by focusing on individual factors alone, and that social and psychological factors must be considered as well. Nevertheless LIRO, which claims to focus on researching all issues associated with logging, has, in the last fifteen years, devoted most of its investigations to technical, physiological and single issue factors. Only recently has their research given any attention to organisational issues such as the conflict between production and safety (Sullman & Kirk, 1998) and motivation (Parker, et al., 1993) and perceptions and attitudes towards safety (Byers, 1994; Gibson, 1994a).

While ergonomic approaches have made some progress in making machinery safer, fatigue levels better understood, and personal protective equipment more sophisticated, the approach seems to assume that there will be no risk taking, and no violation of regulations or inappropriate use of ergonomically designed systems. However, evidence suggests that this is not the case. Adams (1988) claims that the strong research emphasis on the management of risk through ergonomic measures may be of no real value if the implications of peoples' motives for behaviour are not accounted for. He claims that "non-motivational safety measures will merely rearrange the distribution of accidents, not reduce them" (p. 422).

Risk

While there is some debate about whether or not age, gender, education level and so on are indicators of accidents on their own, nevertheless there is convincing evidence of connections between age, gender, and risk taking. Whether risk taking is inherent or socially learned, statistics clearly show that young males have more accidents driving and in workplaces, than any other group (Glendon & McKenna, 1995; McKenna, 1983, 1990). However, it is interesting to note that McKenna has found variations in risk taking depending on other factors. For example he found that young men drive faster when they have other young men with them and more carefully when they have a young woman with them. Conversely young women drive faster when they have a young man with them and slower with other young women. This indicates that social factors play a role in determining risk taking.

Perceptions of danger may be shaped by a person's lifestyle and background (Reason, 1990). For example using machinery in poor condition may be deemed dangerous by safety authorities. To others brought up with unsafe and poorly maintained machines that are used in risky ways and circumstances, there may be no perceived danger. Diaz and Cabrera (1997) found evidence of risk familiarisation in certain groups exposed to danger, and it appears that some people have zero perceived risk (Clarke, 1996). Abdalla, Raeside, Barker and McGuigan (1997) noted a higher casualty rate from vehicle accidents amongst lower socio-economic groups, indicating exposure to more accidents, and thus a possible acceptance of risks in that context. McDaniels, Kamlet and Fischer (1992) suggest that risk perception and socio-economic variables play a role in shaping expressed values of safety.

Risk Homeostasis Theory

Wilde's (1982) Risk Homeostasis Theory (RHT) is the most widely debated risk theory. RHT states that people operate as closely as possible to an ideal level of risk. They compare the perceived accident risk with their target level of risk, where they believe there will be maximum utility value (Wilde, 1989). Wilde maintains that people attempt to reduce the discrepancy between experienced risk and the risk level they feel most comfortable with. While this is not a static state, people accommodate change in technology and other conditions, and adjust their behaviour accordingly. In this manner Wilde claims that the degree of caution applied to a person's behaviour determines the accident level. He maintains that both directly experienced and vicariously experienced accidents affect target levels of

risk. When new safety measures such as airbags in cars are introduced this may lower the level of caution, thus preserving the level of perceived risk.

McKenna (1987) disputes the notion of RHT but does agree that some people seek risk more than others. Despite seat belt use being made compulsory, McKenna found that drivers did not always increase their speed. Wilde (1989) maintains that McKenna misunderstands the assertions of RHT, claiming that in such circumstances, behaviour can change. Wilde rightly points out that often there is more than one factor influencing behaviour. He notes, for example, that reduced speed levels may have coincided with reduction in speed limits. However, at the same time governments were encouraging people to go slower to save petrol, and petrol prices had increased. This is a clear example of multiple influences on behaviours.

There has been disagreement regarding RHT based on rejection of the assumption that people are able to assess all inputs into risk, and that they are constantly assessing situations consciously or even subconsciously (Jannssen & Tenkirk, 1988, McKenna, 1987). Moreover, Slovic and Fischhoff (1982) suggest that RHT does not fully explain the apparent human desire for new sensations. Other criticisms of RHT include the suggestion that risk behaviour may just as easily be explained in a model of maximising the utilities of behaviour without a defined level of risk comfort (Jannssen & Tenkirk, 1988).

There are various studies which support RHT (e.g. Heino, van der Molen, & Wilde, 1996; Hoyes, Stanton, & Taylor, 1996; Streff & Geller, 1988; Trimpop, 1996) and some which dispute its contentions (Lund & Zador, 1984; McKenna, 1987; Naatanen & Summala, 1976; Slovic & Fischhoff, 1982). The latter tend to favour a theory revolving around risk compensation. This theory agrees that people compensate in their behaviour for undesired levels of risk, but maintains that they have no definite level of risk comfort to which they adjust.

However, regardless of which theory may ultimately prove most persuasive, there is a general agreement that certain people seek risk more than others (McKenna, 1990). RHT suggests workers may seek risk for stimulation, and that some have a higher threshold than others (Heino, et al., 1996), which may explain why workers will “re-inject interest into it

[work]” (Dwyer, 1991, p. 139). This may be partly derived from individual need, and partly from culture. It implies accident proneness but not necessarily that it is inherited.

In addressing opponents of RHT, Wilde (1989) suggests that training is compatible with RHT because people may alter their desired risk level. However, he tempers this with the assertion that training has not markedly reduced accident rates. He suggests that accidents may be reduced by regulations but only if they are enforced with draconian measures. This has implications both for training and regulatory compliance enforcement.

An issue which neither Wilde (1983) nor McKenna (1989) addresses fully is that of violations, which often involves risk, and may not be voluntary. They focused on a person’s comfort level or their belief of the compensatory effects of taking the risk. Most RHT research has centred around traffic risk. In such circumstances individuals have greater control over their actions. Whether they decide to take risks in certain weather conditions or with different technology and so on, is largely reliant on their own perceptions. Conditions are different in the workplace.

Violation

While some studies may find errors or unsafe behaviour are responsible for up to 80% of accidents (Feyer & Williamson, 1990; Salminen & Tallberg, 1996), Mason (1997) found that the majority of these errors actually involved violations. Though a worker may have learned a skill, a rule or a problem solving strategy for application in the workplace, other factors may override their use in practice, and violations may occur (Lawton, 1998). Reason (1990) notes that whereas an error is the consequence of a mistake and is either physiologically generated, or comes through a lack of understanding. Violations are the result of social processes (Battmann & Klumb, 1993) and involve intentional breaking of rules or regulations.

Lawton (1998) adds that “some violations take people outside the boundaries of safe working practice, making the environment less forgiving of errors” (p. 79). Further, in some instances violations can be errors because the person does not understand the rules and thus fails to protect himself/herself. Reason, Manstead, Stradling, Baxter and Campbell (1990) state that there is a clear distinction between error and violation, noting that a study they conducted showed that violation declined with age whereas error did not and in some cases increased. Moreover men reported more violations than women. Storie (1977) also found a

clear difference in violation between male and female drivers. The latter tended to commit more errors and the former more violations, including risk taking and speeding.

In the literature on violation there has been a focus on driving (e.g. McKenna, 1990; Aberg & Rimmo, 1998). In such situations there may be peer pressure, and this is also found in workplaces (Dwyer, 1991). A boss or fellow worker may demand that a violation is made to reduce time taken or to increase production. Violations may occur where safety is not as important to a person as bravado, where regulation compliance may be denigrated by people in the workplace, or where there is little concern for safety amongst staff. Parker, Reason, Manstead and Stradling's (1995) findings that young males violated more than other groups indicates that violation and risk may have clear links. Not only are certain groups more willing to take risks but also they may be more prepared to break rules. While this study was concerned with driving, it is reasonable to expect that work related violation and risk taking may have similar links. In addition Parker, et al. found a link between self-reported tendency to commit violations and accident occurrence. They found that even when age, gender and effects of exposure to danger are controlled for, there is a clear association between violation and accidents. Conversely they found no link between reported error-proneness and accidents.

Reason (1990) makes a distinction between routine and exceptional violations. The former exist because of a tendency to take the path of least resistance and to maximise gain. This may be as minor as driving slightly above the speed limit or not wearing safety gear. In a workplace where transgressions are commonplace, they may not even be regarded as violation. Because accidents through violation are not a daily phenomenon, there are few natural discouragements. Rather, there is sometimes encouragement because of resulting production increase, or reduced task time. In making routine violations workers might even gain approval from the boss (Beaudin, Jacoby, & Quick, 1997; Sundstrom-Frisk, 1984). Exceptional violations involve the calculated decision to break a regulation, usually because of unusual circumstances such as the need to achieve a goal which has been blocked by unexpected events (Reason, 1990).

Organisation and violations

Hollywell (1996) maintains that hardware failures, quality control failure, too many potential decisions in systems, redundant components, and failure to anticipate human error are all

elements of system dysfunction which occur in organisations. They have the potential to elicit a culture of violation. Johnson (1996) suggests the problem of violation must be addressed by utilising stringent technological systems to ensure accurate measurement of safety tolerances in machines, combined with thorough analyses of human factors and organisational systems. However, this assumes that there are resources available for such an approach as well as the inclination of management to implement it. This is more likely to be achievable in large companies. Ringen, Englund, Welch, Weeks and Seegal, (1995) note that in small businesses, organisation may be inadequate for ensuring systems which do not elicit violation. Because of relatively small profits and economies of scale, businesses may be unable to spare the money, time or energy to develop or improve systems which reduce the likelihood of violation. Ringen et al. further note that the variability of environment and changing expectations of the wider industry may require constant adaptation of systems, which may be beyond the resources of small businesses.

Le Plat (1987) suggests that within socio-technic systems theory, there are subsystems which may dysfunction and create danger. Where there is poor co-ordination between subsystems, so that maintenance of machinery is poor, or one activity forces violation in another (such as pile-ups creating pressure) there are likely to be accidents. Saari (1984) stresses the importance of communication between management and workers which is essential to functional systems. However, his emphasis, along with most of the organisation and systems oriented research, is on eliminating error rather than acknowledging the part played by violation.

Enforcement and compliance

The advent of generic legislation in health and safety has attempted to shift the responsibility of compliance with safety regulations away from government agents onto the employer and employee (Eisner, 1995; Lamm, 1997). However, Langley (1998) found that employers have not necessarily taken on that responsibility. This supports Eisner's research which indicates that such an approach may have weakened the deterrence value of safety regulations, and also Gun and Ryan's (1994) assertion that generic legislation does not appear to reduce accidents. There are fewer clear guidelines for either employer or employee (Battmann & Klumb, 1993). Thus there is more latitude for interpretation and possibly for covering up accidents because enforcement is not stressed and workplaces not policed. Duncan (1995) maintains that in a climate of economic deregulation the emphasis of most programmes is on

maximising profit. Simard and Marchand (1994) note that although the role of government inspectors has often been minimised, it has not necessarily been filled by company personnel. In support of this, Langley (1998) noted that with minimal OSH inspections in New Zealand workplaces, many accidents were not being reported. Bell (1998) maintains that in New Zealand logging, as few as 20% of accidents may have been reported to the bush inspectorate.

In industries which have a fixed environment, warning signs and other forms of 'education' have been used in an attempt to improve safety. However, Hathaway and Dingus (1992) suggest that this is largely unsuccessful except in low cost situations. In other words when there is too much effort required to comply, compliance is low. Only when there is a consequence attached to the warning is there likely to be any improvement in behaviour. This supports Wogalter, McKenna and Allison's (1988) suggestion that warnings are only effective when they interact with other factors which increase warning effectiveness.

It appears that consequences are the important elements of compliance. Consequences can be in the form of punishment or rewards. Stromsvag (1998) investigated a scheme in Australia where contractors were rewarded for performance and compliance, and found that safety improved over time where rewards were received, though not as much as expected. Forms of evaluation were rather vague which may have compromised the study's findings. Mayhew and Ferris (1998) found that a combination of education and enforcement through prosecution was better at improving compliance than enforcement alone. The small scale builders from the metropolitan areas they studied were more likely to have frequent and ongoing contact with the inspectorate than those from more remote areas. The latter had a lower compliance rate. The study did not investigate the effects that isolation might have had on a culture of voluntary compliance.

Inspection and enforcement may nevertheless help reduce accident levels. Nelson, et al., (1997) found in a large study in the US that after having been cited for non-compliance, employers were 2.3 times as likely as control employers to experience a reduction in accident claims. This may have meant either better safety levels or more cover-ups. Nelson et al. add that smaller businesses were less likely to be inspected than large ones, and consequently accident rates were higher in the former. Lindell (1997) supports this and also found that when workplace inspection were increased, lost time injury rates decreased significantly. He

maintains that to be effective inspections must be regular and frequent. He notes that a phenomenon he calls 'storming' where staff quickly put things to rights before an inspection is prevalent and contaminates inspection data.

Gun (1993) found that compliance in many organisations was largely carried out to avoid prosecution. This is supported by Petersens' (1996) findings that employers were increasingly inclined to treat accident prevention and compliance as two unrelated issues. Gun found that most companies, when they did comply with regulations, used safety training, accident investigation, dissemination of information, and safety policies as their methods. However, he suggests that such semi-voluntary compliance is only effective if it complements enforcement from OHS.

While Gun (1993) suggests the need for more enforcement, C. McLean (1998) notes that prosecution is not generally high. He found that even though fines in many instances are substantial, there is insufficient frequency of prosecution to have an impact on violation. He suggests that it is likely that when an employer weighs up the cost of compliance against the cost of prosecution the latter is cheaper, particularly in the case of large organisations. Further he notes that it is common for OHS inspectors to focus on serious injury rather than serious negligence.

Lamm's (1997) study of small businesses in New Zealand revealed that there were fewer resources available to assist in compliance than large businesses. Hopkins and Hogan's (1998) findings support this research. They found that many small businesses struggle with profitability and so have little time for safety issues. Lamm notes widespread dissatisfaction amongst many employers who felt that the regulations did not take account of the difficulty that they would have with compliance. Lamm found that many small businessmen relied on their accountant to help them with compliance which is indicative of the fact that compliance is geared towards ensuring the paper work and systems meet the requirements rather than there being a safer workplace. This supports the general trends in safety regulation compliance which Ashby and Diacon (1996) identified in English companies. Carson and Johnstone (1990) suggest that until enforcement is severe there is likely to be only half hearted attempts to take safety seriously.

However, while it appears that accidents may be reduced by greater levels of enforcement, nevertheless most small organisations cannot rely on the continual presence of a safety officer

or inspector. Instead it is necessary for the employer and employees to build a safety culture which encourages compliance. The safety culture relies on good communication, co-operation and interaction between personnel in an organisation. These are contingent not only on good organisation and systems but also on good relations between people in the workplace (Cohen, 1977).

In much of the safety literature (e.g. Robinson, 1982; Rundmo, 1994a,b) workplace relations are classified as organisational. However, employer-employee relations are also part of the workplace culture which has a separate place in the literature. Pidgeon (1998) notes that a safe workplace culture acts as a precondition for safe organisations.

Safety culture

Zohar (1980) was among the first researchers to contend that organisations had a safety culture. He explained that safety culture was a summary of beliefs and perceptions the workers held about the safety in their workplace and the way they should behave in relation to risk. Safety culture is generally measured by surveys which focus on worker and management perceptions (e.g. Carroll, 1998; Cheyne, Cox, Oliver & Tomas, 1998; Diaz & Cabrera, 1997; Williamson, Feyer, Cairns & Biancotti, 1997). Researchers have given a variety of definitions for safety culture. Most agree that safety culture includes on the one hand norms, attitudes, and beliefs and on the other hand structures and practices to promote safety and reduce hazards (e.g. Turner, Pidgeon, Blockley and Toft, 1989; Bate, 1992; Uttal, 1993). Bates suggests that safety culture should be treated as both what an organisation is, and what an organisation has. Pidgeon (1991) maintains that safety culture is a relatively stable state.

There is some difference in the literature between safety climate and safety culture. The former is usually seen as a more transient mood state, sensitive to pressures from beyond the workplace. The latter refers to the systems, procedures and behaviours of the organisation which are stable (Cox & Flin, 1998). These authors note that climate, which responds to change from beyond the organisation more quickly, must be compatible with the safety culture to ensure congruence. Where organisational culture is characterised by management complacency, role ambiguity, poor communication and low prioritisation of safety against high pressure for performance, there is usually a high level of accidents (Pauchant & Mitroff, 1992; Vaughn, 1996).

Diaz and Cabrera (1997) noted that when different companies were compared there was a clear link between safety culture and safety level in the organisation. Clarke (1998) found in a study of serious accidents in British Rail that a breakdown in the safety culture was responsible for many of the fatal accidents which took place. Importantly Diaz and Cabrera maintained that a good safety climate and high levels of production were not incompatible if the organisation was well structured and managed. Evidence of the importance of management commitment to safety and the smooth running systems of organisation is found often in the literature (e.g. Dedobbeleer & Beland, 1987; Niskanen, 1994; Pidgeon, 1998). The safety culture and climate are also contingent on good leadership, and good worker-employer relations, as well as a clear belief on the part of the workers that their workplace is safe. In taking on this belief workers seem to take less risks (Dedobbeleer & Beland, 1987). Safety culture measures sometimes include management perceptions as well as workers' (e.g. Niskanen, 1994). In such instances it is often found that management maintains that safety is higher than do the employees (e.g. Gibson, 1994b). This may reflect a tendency for management to put a more favourable light on safety because they do not wish to appear negligent.

Clarke (1986) found that safety culture was strongly influenced by the manager's actions and attitudes. She suggested the lack of ongoing monitoring was responsible for breakdown in safety culture. This is supported by Komaki's (1986) finding that lack-lustre managers rarely monitored work, and this impacted on the safety of the organisation. Carroll (1998) adds that to be successful in developing a good safety culture, managers needed to respond appropriately to ongoing changes in society and the economy. Cheyne et al. (1998) investigated the relationship between safety management and safety standards and how these affect workplace environment and group processes. They found too that the attitudes of management towards safety and towards individual workers had a crucial part in safety culture. They suggest their study highlights the need to begin safety programmes by focusing on management action.

Pidgeon (1998) suggests that many accidents are organisationally induced. He maintains that in order to organise a workplace so that it is safe, there must be smooth functioning systems of production. However, he notes that it is imperative that organisational outcomes should be equally focused on production and safety. He suggests that in order to bring congruence an interdisciplinary approach is needed where all factors are taken into account. Cox and Flin

(1998) support this belief by referring to the customised safety culture measures on offer through industry which take no account of underlying frameworks in a given organisation.

Much of the literature suggests that it is important to recognise the complex set of interactions and chains of events which comprise the total set of processes within a workplace and which may be viewed as part of the workplace culture. Nevertheless, studies on specific factors play a part in understanding the whole. One area of research which has important implications for safety culture is the issue of abuse and violence.

Abuse and violence

A subject which often seems ignored in accident literature, and appears to have received no attention at all in New Zealand logging is worker abuse. Workplace abuse or violence is generally defined as verbal abuse, threatening behaviour, physical altercation or damage to property (Eisele, Watkins & Matthews, 1998). These authors found that one in four full-time workers in the US were victims of a violent episode and cite evidence that in the US between 1987 and 1992 approximately one million assaults took place annually in workplaces. They suggest this violence occurs largely because of stress in the workplace, much of which has developed because of massive reorganisation and restructuring. They claim there is a pervasive fear amongst workers regarding security of employment which is threatened because of considerable downsizing, redundancies and reorganisation. Moreover, they note that even those who survive lay-offs experience serious symptoms of stress, fatigue, reduced motivation and depression as much as five years later. Workers then become more acquiescent to aversive consequences in the workplace. Eisele et al. note that many workplace assaults may not be reported for fear of reprisal.

Workplace violence can have serious repercussions not only for the individuals involved but also for the general functioning of the workplace. Cole, et al. (1997) found that the effects of workplace violence include reduced production, increased turnover, absenteeism, psychological complaints, burnout, and general dissatisfaction. They also noted that lay offs, lack of harmony in a group, diminished support, and reduced co-worker support, all contributed to violence. This supports Martinko and Gardner's (1982) and James and White's (1983) assertion that punishment, particularly non-contingent, creates deterioration of performance and subsequent increased abuse. Various other studies support these assertions (e.g. Barron, 1998; Mullen, 1997; Einarsen, Matthiesen, & Skogstad, 1998;

Stanton, 1993). Cole et al. (1997) suggest that the job climate is directly linked to workplace violence, and that often the climate is poor because tasks are not being performed adequately and there is resulting frustration

In the literature many studies of workplace abuse and violence refer to that between workers, or workers and outsiders (e.g. Barron, 1998; Eisele, et al.; 1998; Mullen, 1997; Rayner, & Hole, 1997, Tidwell, 1998). However, there is also reference to employer bullying (e.g. McCarthy, 1996; Rayner, 1998). And it seems that there has been a rise in conflict between employers and employees (Tidwell, 1998). Smith and Peterson (1988) note that the two way interaction between workers and leaders contributes to how well both perform, and this can contribute to or detract from frustration and consequent abuse.

Cole et al. (1997) maintain that violence is more common where the workplace is more competitive and strained, where there are poor employer-worker relations and where there is low supervisor support. They found that poor managerial practices and poor communication between co-workers and supervisors lead to violence. They suggest that violence is may be a reaction to frustration but it may also be a means of coping. Other studies have revealed similar findings (Chen & Chen, 1992; Spector, 1975).

Bass (1990b) maintains that abuse and general aversive behaviour from a boss which is not contingent on specific behaviour can create confusion and possibly learned helplessness. This assumption is supported by the findings of McMoore, Seigne, McGuire and Smith (1998) in an Irish study. They note that there are varying degrees of tolerance to abuse and violence between different populations, indicating some workplace cultures may foster learned helplessness. It is important to distinguish between contingent and non-contingent punishment. While Ashour and Johns, (1983) and Larson, (1984), both studies found that punishment could reduce poor performance, such punishment was more formalised, predictable, and involved clear consequences including warnings and dismissals, rather than abuse.

The way that consequences for behaviour can affect the wider social processes in safety culture have been examined in some detail by behavioural researchers.

Behavioural Model

Behavioural researchers in accident analysis do not see Heinrich's work as incompatible with behaviourism (Chhokar & Wallin, 1984). Taking a cue from Heinrich's 88% of accidents being attributed to unsafe acts, the behavioural model focuses on analysing contingencies which contribute to accidents. Behavioural approaches assume that theory related to accidents will be no different from any other behaviour theory. The focus on observation and analysis and measurement of behaviour and the subsequent attempts to change that behaviour are part of the underlying principles of behaviourism.

One difficulty in analysing accidents through behaviourism is that while a serious accident may be a powerful consequence, accidents are probably insufficiently frequent to provide a reliable punishment for unsafe behaviour (Beaudin, et al., 1997; Sundstrom-Frisk, 1984). Heinrich (1959) contends that out of countless unsafe acts, and unsafe conditions, 300 would result in accidents, 30 of these would cause minor injury, and probably only one would be a major injury. This represents a very infrequent aversive stimulus and Chhokar and Wallin (1984) suggest that it is a major reason why workers indulge in unsafe acts. In fact unsafe behaviour may be rewarded more often than it is punished. Sundstrom-Frisk (1984) notes that while certain consequences presumed to be reinforcing can be introduced, other contingencies are operating naturally which can over-ride those encouraging safety. Fuller (1990) proposes that the reinforcement history of experienced individuals makes them less likely to behave cautiously in situations where inexperienced people might. He suggests that this may explain why experienced drivers, for example, still have accidents despite their supposed skill levels. They are desensitised to the likelihood of accidents.

As workers become less sensitive to danger they may take more risks, especially if there are incentives to do so. Sundstrom-Frisk (1984) states that in Sweden in the late sixties and early seventies, considerable effort was made to reduce forest accidents through reinforcement of safe behaviour. The results were less than hoped for, which may have been because the prevailing piece-rate system of payment reinforced risk taking and thus over-rode the supposedly reinforced safe behaviours. Contradictory results have been found in the effects of piece-rates on safety behaviour. Keenan, Kerr and Sherman, (1951) found no correlation but Mason (1997) found increased accident levels with piece rates. Sundstrom-Frisk in assessing several studies concluded that there is a valid relationship between piece-rates and accidents under some conditions but possibly not all. Of particular importance in Sundstrom-

Frisk's study was the acknowledgement of confounding variables which, in a natural setting, inevitably impinge on the dependent variable introduced. However, even taking the most obvious confounds into account he concluded that piece-rates could increase unsafe behaviour. It is the existence of naturally occurring contingencies which makes behavioural analysis of work in field settings so difficult.

Behavioural Research Focus

Behavioural analysis proponents also maintain that too much research focuses on unsafe acts rather than factors that reinforce safe behaviour (Tarrants, 1970). Komaki, et al., (1980) suggest that after-the-fact measurement contributes little to understanding of what fosters a safe environment, and is often unreliable because it relies on reporting and recording which may be inaccurate. Applied behaviour analysis suggests setting up contingencies predicted to promote safe behaviour, and ensuring accurate observation and thorough analysis (Fitch, Hermann & Hopkins, 1976). In support of this Guastello (1993) reviewed several behavioural intervention studies and found that such behavioural interventions reduced accidents between 12 and 94%. Geller (1987) claims that such an approach is the most cost effective way of analysing and then reducing accidents. It must be noted that such interventions require strict control of the environment. Considerable effort goes into setting up procedures, monitoring progress and ensuring feedback and appropriate reinforcement. It is more practical to implement such interventions in a fixed and stable environment than in environments such as construction or logging. Moreover these interventions are only for limited periods of time and are likely to attract responses for the novelty value similar to the Bank Wiring Observation Room phase of the Hawthorne Studies conducted by Mayo (Osborne, 1995; Quinlan & Bohle, 1991). They perhaps exemplify the results which might be expected if there were no competing contingencies and considerable resources were invested in ensuring their success.

Consequences are more likely to change behaviour than antecedents (Beaudin, et al., 1997; Komaki, 1998). However, in some instances antecedents can reduce unsafe or improve safe behaviour. In the case of accidents Reber, Wallin and Chhokar (1990) found that goal setting produced improved safety performance though it could be argued that the achievement of goals provided a natural reinforcing consequence. They found that attaching feedback to the goal setting further improved the safety behaviours. Chhokar and Wallin (1984) used a withdrawal design in a factory to measure the effects of training, goal setting and feedback

on safe behaviour and reported considerable success in applying positive reinforcement to safe behaviours. Of particular interest was the finding that in the withdrawal phase of the study, safe behaviours declined markedly, indicating how important the maintenance of reinforcing consequences is in any safety programme.

Others who have used behavioural approaches to identify unsafe behaviour and provide extrinsic reinforcement for safe behaviours include Chhokar, (1987), Haynes, Pine and Fitch (1982); Komaki, Barwick and Scott, (1978); Krause, Hidley and Lareau, (1984); Ray and Bishop, (1995); and Villane, (1995). Some studies have given emphasis to goal setting to enhance the performance of safety behaviours including: Kim and Hamner, (1976); Mattila and Hyodynmaa, (1988) and Steers and Porter (1974). Feedback has featured as a very important reinforcer of safe behaviour in many studies such as : Sulzer-Azaroff (1978); Sulzer-Azaroff and de Santamaria, (1980), Zohar, Cohen and Azar, (1980), and Komaki, et al., (1980), Brown, Willis, and Reid, (1981), Fellner and Sulzer-Azaroff, (1984), Mattila, and Hyodynmaa, (1988). Komaki (1986, 1998) makes the very important point that feedback is unproductive if it is not contingent on appropriate behaviour.

Just as safety culture researchers focus on the role of management, many behavioural studies investigate how work behaviours are monitored (Komaki, 1986). In a study of manager effectiveness, Komaki noted that monitoring was most effective when it was direct observation and collection of information rather than self-report from subordinates. Komaki (1998) points out that accurate, methodical and constant monitoring is vital for providing appropriate consequences, particularly for promoting safe behaviour. Without reasonable levels of monitoring any consequences provided are likely to be non-contingent which creates less satisfaction with supervision (Podsakoff & MacKenzie, 1985). Bass (1990b) notes that non-contingent punishment tends to encourage confusion and consequent learned helplessness. This supports Podsakoff, Todor and Skov 's (1982) and Martinko and Gardner's (1982) findings. It follows that there will be similar confusion with non-contingent reinforcement.

However, unless a supervisor or employer has systems which allow time to monitor, and then provide reinforcement or punishment, these will not occur appropriately. Moreover, workers will develop their own systems of internal feedback, on the basis of acquired 'expertise', whether safe or not. "The probability of violation increases if the external

feedback is low and feedback on a discrete action is delayed or ambiguous, or if internal or external feedback from different sources are discrepant” (Battmann, & Klumb, 1993, p 41).

The role of supervisors in creating consequences for safety related behaviour has been thoroughly investigated in behavioural research. Lacroix and Dejoy (1989) found that critical to workplace safety was how supervisors respond to workplace accidents. Some supervisors, who are very punitive, are inclined to attribute accidents to failure to take proper care and to follow rules and instructions. Others are more inclined to consider the wider environment and attempt to make changes to reduce the likelihood of accidents. Lacroix and Dejoy found that often supervisors over-attribute to lack of effort, which may result from self-protective or self serving motives. Where supervisors have a propensity for this, it is likely that behavioural programmes will be unsuccessful. Supervisors are particularly prone to blaming workers’ poor efforts to be safe in the case of serious accidents (Mitchell & Kalb, 1982; Mitchell & Wood, 1980). Moss and Martinko (1998) note that following poor worker performance, supervisors avoid providing feedback, or delay or distort the feedback they do provide. This indicates a problem with the whole process of behavioural consequences.

Enforcement of rules and regulations usually involves punishment or the threat of punishment. It may also be seen as reinforcement if compliance is accompanied by some form of feedback/reward. Hagenzicker (1991) found that enforcement produces compliance if it is actually carried out and that blue collar workers respond differently, and often with less compliance to enforcement, than white collar workers. Seekins, Fawcett, Cohen, Jason, Schnelle, & Winett’s, (1988) research investigating the effect that enforcement has on regulation compliance, noted a clear improvement in compliance but only when enforcement was very strong and regular. There is some evidence that enforcement consequences may generalise. Ludwig and Geller’s (1991) study amongst different groups found that there was considerable response generalisation, thus indicating some form of vicarious learning through other people’s reinforcement or punishment. Another factor may have been the desire for approval from a group where compliance was approved of. There can be competing contingencies in the case of compliance. Wogalter, et al., (1989) found that even when compliance has a high associated cost, the consequences of peer pressure could over-ride that cost.

Behaviourism in the Field

Quinlan and Bohle (1991) note that behaviourism has gone some way to reducing accident levels when implemented thoroughly. However, they observe that success is dependent on ensuring that safety interventions do not have to compete with other consequences such as piece rate schemes or excessive production pressure. Most studies are precisely set up and carefully controlled. The assumption appears to be that such conditions can be recreated in any workplace. Clearly in workplaces where the environment is unpredictable and constantly changing and where personnel and resources are limited, this would present a problem. Moreover, Quinlan and Bohle maintain that traditional behaviourism does not give sufficient recognition to social and physical environmental influences which are primary causal variables. On the other hand Beaudin, et al., (1997) suggest that behaviour is also maintained by social reinforcers. Quinlan and Bohle contend that the focus on individual behaviours means that greater issues, such as the complex trade off between safety and productivity, have not been systematically investigated. Consequently interventions are generally confined to "activities like improving selection procedures, upgrading training and introduction of behaviour modification programmes" (p. 59).

Behaviourism, in fact, does emphasise the existence of natural consequences in all environments (Skinner, 1976). However, the application of theory has as its focus the modification of specific behaviours. Maximum control is considered important, with withdrawal design the ideal procedure for implementing the change. Behaviourists do not consider it acceptable to speculate on the effects of natural contingencies. Consequently there is little research which takes behavioural principles and attempts to analyse workplace safety in field settings in a more holistic manner. One of the criticisms of the behavioural approach is its lack of attention to wider processes within the workplace and beyond. The problems of social and economic influence in the workplace are often ignored in accident research but require some discussion for the present study.

The Sociological Systems Approach

There are numerous approaches in accident research (e.g. Diaz & Cabrera, 1997; Leplat, 1987; Mancini, 1987; Reason, 1995; Robinson, 1982) which look at organisational patterns and systems. Proponents of the systems approach maintain that viewing accidents as unsafe acts ignores the interaction of people and the environment. Generally, systems oriented approaches focus on organisations, studying management-worker interaction, organisational

climate, different levels of behaviour, or information processing. However, discrete organisations within the forest industry of New Zealand are not easily identifiable (Rowse, 1997). Because there is no definable single organisation, it is appropriate to look at accidents from the sociological angle, recognising that each crew is a microsystem within the macrosystem of the wider industry (Bronfenbrenner, 1979).

Class conflict

Fundamental to the sociological approach is the belief that the primary cause of accidents is the social organisation and its context. Holmes and Gifford (1998) suggest that risk is construed through social context, hierarchical assumptions and shared assumptions about risk. The notion that there is always individual choice in an unsafe act ignores the realities of the workplace which may be imposed from another level (Carson & Johnstone, 1990). Sociological theorists say that most accident analysis ignores the conflicts of interest within industrial societies between employer and employees. Williams (1993) maintains that class issues produced by the division of labour and the associated hierarchies within organisations underlie safety issues in the workplace, creating a clash of interests. "The hazards of work fall disproportionately on one class, and management is generally sheltered from risks. In addition the worker is dependent on employers for jobs however hazardous" (p. 60).

This basic conflict between workers and management also emphasises the differing perceptions within organisations. Management view their own jobs as stressful but not those of the workers, irrespective of what basic stressors may be inherent in the workers' role, and how that stress might affect safety. They may blame risk taking and accidents on workers' carelessness or stupidity. Workers on the other hand tend to blame accidents on equipment, and the danger inherent in the job. Workers see safety as part of the conflict of interests between themselves and employers, whereas management contend that safety violation is largely the choice of individual workers (James, 1987). James argues that because accident reduction entails costs to employers for which the benefits are not specific or immediate, it is often considered economically inefficient to promote safety. It is a question of priorities and thus safety is inextricably part of the social relations of production

The manipulation of safety issues by both workers and management is seen by sociologists as underlying most factors related to accidents. For example Willis's (1989) study suggested technology may be introduced as part of management efforts to assert dominance over

workers. Nichols (1975a) maintained that often malingering is the workers' way of compensating for what they see as inadequate compensation for their labour or the risks they take. They may even deliberately injure themselves in order to receive perceived benefits. Willis (1986) investigated repetitive stress injury (RSI) within the social and political context, saying the workers' struggle over RSI is part of the resistance to the dehumanisation of work. On the other side of this class conflict Hopkins (1989) found evidence that RSI was defined as a neurosis by employers and insurers. This indicates that there is an ongoing covert bargaining between workers and employers over injury, largely in terms of economics.

Power imbalance

Hopkins and Plaser (1984) argued that higher levels of bureaucracy within a mining operation contributed to higher accident rates because workers had less autonomy. James (1987) investigated the conflict between capital and labour as a cause of industrial accidents and concluded that prevention is contingent on perceptions of risk embedded in the social relations of the workplace. There are often conflicts between employer and employee about perceived risk levels. Because, as Dwyer (1983) suggests, employers have a disproportionate amount of power, authoritarian behaviour from employers creates worker dissatisfaction which in turn can be an important cause of accidents. The power imbalance can have implications for safety negotiation. For example Carson and Henenberg (1988) found that safety representatives were reluctant to halt unsafe work because they were in a position of perceived weakness. Dwyer (1992) states that: "...safety is produced when... workers have authentic freedom to decide whether to proceed or not with their tasks" (p 270).

Ongoing changes in both organisational practices and legislation can change the degree to which these conflicts of interest impinge on or promote safety. Sociologists claim that existing frameworks for analysis of accidents, used to develop legislation, support the ideology of the managerial class. They locate too much responsibility for accidents with the worker and insufficient in the workplace and the wider environment (Quinlan & Bohle, 1991). Williams (1993) considers the inequality of power in safety issues is such that although there is a bureaucracy set up to mediate and balance this one-sidedness, the regulations and rulings "are exercised within the context of unequal power relations at the workplace" (p 61).

Added to this, the resources available to the employer seeking legal redress may be vast compared to that available to the worker, or even to a government agency (Polk, Haines & Perrone, 1993). Greater economic resources mean that the employer may try to find ways around the law rather than keeping to its essence. The role of employer does not have an inherent motivation to reduce accidents. It is only when external incentives such as reduced accident insurance levies or avoidance of prosecution, are introduced that employers are inclined to take action.

Parsons (1989) suggests that politics play a large part in safety legislation and regulations. He cites the fact that despite safety legislation and decades of government fostering safety oriented programmes in Canada, accident levels have not improved. He indicates that this is because safety is incorporated in the total 'bargaining package' decided between workers and employers, and the focus tends to be on money at the expense of safety in those negotiations. Parsons claims that without worker representation through unions and strong enforcement through government, safety committee effectiveness is weakened considerably. Worker participation is crucial to improving safety.

Industrial relations

Quinlan (1993) maintains that within the field of industrial relations safety is not high on the agenda, because wages and benefits are the traditional focus. He suggests workers may fear that by shifting negotiations away from material gain they will lose money at the expense of any gains in safety. In addition, the separation of Occupational Safety and Health (OSH) from industrial relations has allowed an individualised and managerialist explanation of occupational safety to gain dominance. In New Zealand, where there is little union presence in the forests (Rowse, 1997), the collective rights of workers are likely to be weakened by those labour laws (Quinlan, 1993) such as the Employment Contract Act (ECA). Quinlan suggests that this also undermines effective avenues for redress provided by the regulations. Despite the development of regulation compliance strategies of state agencies such as OSH, the weak position of workers is not recognised. For example James (1987) notes that though workers often consider safety equipment inadequate they may accept the situation, demonstrating apparent acquiescence to the inevitability of injury. Interpretations of the seriousness of injury may also vary. For instance, the level of seriousness at which miners officially complain of injury depends on prevailing circumstances such as accident compensation (Hopkins, 1989).

Research has shown that people will undertake dangerous work in return for more money (Grunberg, 1983). In looking at specifics which might contribute to accidents, economic issues often come to the fore in sociological analysis. Mayhew and Gibson (1996) found self-employed builders had a poor understanding of health and safety which was exacerbated by the fact that the builders said it took too much of their time to become familiar with all the issues. They also suggested that economic conditions, and serious competition from other builders limited the amount of time and money they could put into health and safety. This gives some support to Anderson and Buchholz's (1988) finding that there was a relationship between economic instability and injury. Jayne, (1998) notes that there has been little stability in the 1990s in New Zealand forest industry, which has implications for safety in logging.

Safety and culture

While economics may play an important role, social pressures within an organisational culture can influence safety as well (Hopkins, 1984; Osborne, 1995). Workers can feel pressured to not report accidents or seek help, for fear of derision from fellow workmates or the employer. On the other hand, Williams (1993) refers to the 'masculine' nature of logging, where the experience of accidents, near misses, and taking risks is part of the job and learning to 'be a man', providing workers with status amongst their peers. She notes that it is in the workers' interests to have a safe working environment, and in an employer's to have a high production operation. However, because risk taking is taken for granted and at times glamorised, it is still common for most workers to blame the victim of accidents. Hopkins found that while some of the literature indicates social pressure is a major source of accidents and that the culture of masculinity promotes risk taking, over-riding any such behaviour is a level of awareness and avoidance of danger when risks are clear and unacceptably high.

There are few specific sociological theories relating to industrial accidents. Dwyer (1991) has conducted research on workplace accidents both in New Zealand and overseas over the last two decades. He has posited a theory to explain accidents from the broad sociological stance while at the same time giving focus to differing levels of interaction depending on the emphases predominating in a particular workplace.

Dwyer (1991) bases this theory on the sociology of work and the notion that accidents are produced through the functioning of social relations in the workplace. Dwyer (1995) defines

social relations as "the way in which the relationship between people and their work is managed. In a theorisation which takes up various categories of classical sociology, work relations can be conceptualised as existing at three levels within a workplace: rewards, command, and organisation. In addition there exists a level of reality, the individual member level, at which actions are produced which cannot be explained in terms of a theory of social relations. The use of the term level does not imply the existence of a hierarchy....Although the levels are distinct from an analytical viewpoint they are interrelated. A change in one may alter the way the other operates and this may affect productivity, quality, industrial action or accidents" (p 253).

Dwyer's (1991) theory is based on the notion that there is a constant central conflict between capitalists and workers. The former wish to maximise profits and the latter to increase the benefits gained through their labour. However, he notes that the respective parties' interests cannot be seen as confined to economic issues. There are symbolic as well as material forms of motivation to work and both are tied inextricably to culture. Within this context Dwyer maintains that the superior and subordinate members of an organisation "engage in struggles over the diverse ways in which the latter's relationship to the organisation and its tasks are managed. That task dangers in industrial organizations, which pit employers against workers, are but one stake in this conflict" (p95).

As a general set of hypotheses Dwyer (1991) offers the following:

- 1) Social relations of work can produce accidents
- 2) The greater the weight of a particular level of social relations, the more accidents will be produced at that level
- 3) The more control workers have at a given level the fewer the accidents at that level.
- 4) The greater the degree of managerial safety management at a level, the lower the proportion of accidents produced at that level.

The thrust of the sociological approach is towards interaction of systems and groups, whose attitudes, values, perceptions and beliefs extend beyond the workplace and derive from their own role and position in society. Conflicts of interest, and variations in perceptions and priority, produce accidents as a bi-products. It must be noted though, that in any accident event, even though the complexities of causation are undeniable, nevertheless specific behaviour which ultimately leads to injury can often be identified. When a worker slips and is injured, the behaviour immediately prior to the event determines the occurrence and extent of

the injury. It may have been bravado, or hurrying to meet deadlines, or trying to increase work in a piece rate system, but this does not negate the fact that an error in judgement has been made. Feyer, Williamson and Cairns (1997) found in an extensive analysis of work-related deaths in Australia that human error plays a major part in most accidents. They also found that management practices are an important link in accident causation and that being able to identify those precursor events can enable a focus on prevention. When viewing accidents through the sociological approach, it is important to acknowledge the role that error plays in the accident. The analysis needs to be bi-directional. It is this approach which Dwyer (1991) advocates in his theory.

There is considerable emphasis in accident research on practical solutions to accidents based largely on quantitative methods. The focus, particularly in New Zealand logging, on specific interactions, has produced some progress in accident prevention but may have also simply shifted accident occurrence to new places. Many prevention strategies which have been developed by such approaches as ergonomics cannot be generalised to all workplaces because there has been no account taken of the context and social processes which may affect the likelihood of accidents. On the other hand the more general theory which Dwyer has proposed has application to a wide range of situations but does not allow for the way that specific factors may influence risk levels in specific types of workplace.

Discussion

The preceding review of accident literature has relevance to the present study's findings but it is important to remember that Grounded Theory methodology directs the researcher to investigate an area of interest without any assumptions about previous theory or research. The above research has contributed to knowledge of accidents and is thus a good background for understanding general perspectives on accident causation and prevention. However, it has provided a perspective which the present research complements rather than contradicts, and should be viewed in that light.

To investigate safety in logging it is necessary to use a method which facilitates a focus on the specific and yet at the same time places these specifics within the social processes of the wider context. A qualitative approach was considered most suitable for this. The following chapter develops the rationale for this and details the procedures and analyses used.

Chapter Five

Method

This chapter presents the aims of the study, a rationale for the qualitative approach, an outline of the method used and the procedure of the main study.

Aims of study

This study investigates the social and structural processes which affect safety in New Zealand logging crews.

Rationale for use of Qualitative Methodology

Most safety research has used quantitative methodology. This has been particularly useful in accumulating epidemiological data and subsequently identifying patterns of injury occurrence. It has also been useful for furthering understanding of immediate causes in fixed environments such as factories. The ideal quantitative study is an experimental design, where control over the environment enables understanding of the contribution of specific factors (Devine, Wright, & Joyner, 1994). It is difficult to implement such a study in the field where workplaces are as scattered as logging sites are and where work takes place in an ever changing environment (Fetterman, 1994). The ACC epidemiological study (Kawachi et al., 1991) concluded that human factors such as the impact of the learning process may play an important part in forest safety. Within such factors as learning (both formally and informally), there are social processes which mediate and moderate the effectiveness of any interventions. Mattila (1985) notes that it is qualitative data analysis which is particularly suited to gaining an understanding of such social processes.

Pernice (1996) suggests that it is important to recognise the limitations of both qualitative and quantitative methodology. Quantitative methods tell us whether an issue is important in a population but may not give the depth of understanding to know what to do about the problem. She notes that when standard quantitative measures have been used extensively, qualitative methodology may enhance understanding not achievable through statistical methods. This concurs with Purswell and Rumar's (1984) belief that some new directions in accident analysis may best come through qualitative research. There is a need for a new approach through qualitative analysis in logging, to find new perspectives on safety.

Within most forms of qualitative analysis one observes, records and senses what is happening through naturalistic inquiry, with as few preconceptions as possible. This allows unanticipated but possibly important factors to emerge. Lincoln and Guba (1985) maintain that naturalistic inquiry must be conducted holistically, with the researcher becoming part of the environment through interaction and participation. Beliefs rather than facts are focused on, with the intention of uncovering individual perspectives and multiple realities (Merriam, 1988). Qualitative analysis is ideal for investigating small scale within the larger social realities which contribute to such phenomena as accidents (e.g. Guba & Lincoln, 1994; Patton, 1990; Sultana, 1991). It also allows the flexibility needed to take account of dynamic processes, through avoiding both imposed structure and fixed analysis.

Qualitative methodology is also useful for understanding how peoples' actions and attitudes are shaped by their historical and cultural environments (Shimahara, 1988). Sherman and Webb (1988) contend that interpretations of current social processes should take account of these contexts. Although a focus on small groups may reduce generalisability, qualitative research allows a deep and rich analysis. This in time may build an understanding of social processes, through the accumulation of an idiographic body of knowledge, and thus contribute to theory (Lincoln & Guba, 1985).

Data is commonly collected in the form of in-depth interviews, coupled with observation, forms which are ideal for allowing for change and for capturing perspectives which reveal social processes. There are disadvantages to using questionnaires and surveys, particularly in certain populations. These include the discomfort some participants have with written material or oral surveys, the suspicion that written material may be used against the participant, and the inability of questionnaires to capture unique and insightful perspectives and complex points of view. Furthermore, there are the potential difficulties inherent in low levels of literacy. A literacy test of loggers found 58% were well below normal adult reading levels and of that 58%, the average reading age was only 11.5 years (Cummins, 1999). Unstructured interviews allow participants to engage in discussion of their lives more naturally, without the artificial focus of formal questions. In the instance of work, they can talk with less fear of repercussions. They can direct the conversation, insert what they feel is relevant, add points a researcher might not think of, and make connections which make sense to them, regardless of the researcher's opinions (Hunt & Ropo, 1995). It is more likely that insightful anecdote will emerge from a general conversation, and that humour, excitement, or

incidents of relevance will be forthcoming. Perceptions of specific activities may come from more than one angle.

Colloquial language, general word use and meaning can vary within different groups and in different localities, and sensitivity to these is required. Inappropriate use or poor interpretation of language can confound data analysis. For instance, Ritchie and Herscovitch (1995) found that there were discrepancies between what blue collar workers recorded in written surveys and how they responded verbally. The use of in-depth interviews is a way of capturing this variation. Using alternative or additional information, analogy, and anecdote, to ensure participants understand questions and the researcher understands the answer is sometimes necessary.

The New Zealand logging industry has a large proportion of Maori workers (LFITB Annual Reports). Pernice (1996) suggests quantitative methods may be inappropriate in a multicultural study. Suspicion may bring low response rates. Attitudes can be “personal, complex and context specific which indicates that qualitative methods may be more appropriate” (p. 431).

In unstructured interviews, adjustments can be made to suit each participant and the context in which the interview takes place. Ritchie and Herscovitch (1995) note that during interviews the researcher must avoid dominating any form of data collection and become sufficiently immersed in the culture to ensure appropriate interaction and trust from participants. In the present study’s exploratory investigation, it was found that some loggers tended to think of government authorities, management, and academics with a mix of suspicion and contempt. Informal conversations with a person they trust and can relate to is more likely to draw out useful information. Away from the work place they are more confident the boss will not be told of their beliefs and perceptions. Ritchie and Herscovitch contend that “meeting workers on the home ground... assists [in] reducing any sense of perceived threat to the participants” (p. 478)

Choosing an approach

While Edson (1988) maintains that there is no qualitative method per se but, rather, methods suggested for gathering information which are then used to construct meaning, nevertheless there have been many methodologies offered (e.g. Sniegelberg, 1969, Van Manen, 1990,

phenomenology; Hermans & Hermans-Jansen, 1995, self-narratives; Potter & Wetherall, 1992, discourse analysis; and Plager, 1994, hermeneutic phenomenology; Glaser & Strauss, 1967; Strauss & Corbin, 1990, Grounded Theory). The last approach is suitable for the study to be undertaken, because it focuses on the development of theory which can take account of social processes that affect groups and comprise part of the organisational culture of the workplace. Grounded Theory was chosen to gain insights into the processes surrounding safety which could contribute to an overall understanding of logging accident levels. This approach is ideal, because it is flexible and can be adapted to fit the field in which the study is taking place (Strauss & Corbin, 1990).

Organisational culture

Organisational culture is multi-layered and contains both an overarching organisational culture and numerous subcultures (Hunt & Ropo, 1995). It is these subcultures and their commonalties and differences which were of interest in the present study, though within the context of the greater industry culture. Grounded Theory emphasises the investigation of separate issues, including those unique to individuals and smaller groups. It was considered likely that such issues, which tend to emerge as an inherent part of the approach, would help explain processes particular to specific operations. Moreover, it was hoped that the method would assist in understanding why there are different accident rates not only between regions, but also between different types of logging operation.

Historical influences

Hunt and Ropo (1995) note that Grounded Theory is particularly useful for revealing how historical elements have shaped later events. Greenwood and Hinings (1988) describe how organisations follow the 'tracks' formed by the interplay of core elements across time in a dynamic manner. Hunt and Ropo suggest that, periodically, 'shocks' from within and without the organisation vary the intensity and dynamism of the processes. Such shocks can have effects on participant response. If they occur while the data collection is in process, Grounded Theory is able to acknowledge and adjust to allow for these changes, to assimilate that change, and hold it in comparison to previously collected data.

"Grounded Theory aims at identifying processes or forces that give rise to activity, whereas mainstream organisation analysis concentrates on identifying abstract elements and their relation to activity. In this sense Grounded Theory emphasizes dynamism." (Hunt & Ropo,

1995, p. 381). Grounded Theory is suitable for studying the dynamic nature of the logging industry, which has been undergoing dramatic changes in markets, equipment used, structures of crews, relationships with companies, approaches to training, and the imposition of a new style of regulated safety through the Health and Safety in Employment Act 1992.

Grounded Theory

Grounded Theory uses inductive methodology to discover, develop and attempt to verify theory arising out of the data collected and analysed (Hunt & Ropo, 1995). Beginning with the concrete and contextual, it uses questions and emergent themes to uncover and describe relevant underlying explanations. Its initial development is not influenced by previous research or theory. It assumes that the participants are insiders with a more complex and differentiated understanding of their own environment than the researcher (Lofland, 1971). Specific quotes, reflecting the perspectives of the people in the study, are an inherent part of the data presentation, holding an equal place with the researcher's own interpretation.

There should be a diversity of data which is representative of the everyday reality of those from whom it is derived. Ideally, researchers come fresh to the scene and aim to elicit information with an ongoing awareness and setting aside of their own preconceptions. Discovery begins with the researcher trying to see the world through the eyes of the participants, and then working to uncover the social processes and structures which are fundamental to that world (Woods, 1988).

However, the emerging theory should be understandable by those who contribute to that data and it should make sense to them. It is only later in the evolution of the theory that some connections are made with previously developed theories and findings. For this reason, a literature search is done after the data has been collected. This is not to say that there are no hypotheses developed during data collection, but they should be grounded in the data collected, rather than in existing theories. These inductively derived hypotheses may evolve or be discarded, depending on what patterns and commonalties continue to emerge. Emerging patterns in the initial stages of analysis direct subsequent data collection (Strauss & Corbin, 1990). Initial patterns tend to be less integrative than later ones. The theory may be sufficiently abstract to make it applicable to a variety of situations or contexts when the interpretation is conceptual and broad, and the data is comprehensive. Analysis and development of theory are ongoing.

Grounded Theory application acknowledges the realities and practicalities of accumulating and analysing data within everyday contexts. It aims to be systematic but, at the same time, flexible enough to allow for the changing environment in which the data is collected. "... while we set these procedures and techniques before you we do *not* wish to imply rigid adherence to the... procedures [which] are not mechanical or automatic, nor do they constitute an algorithm guaranteed to give results. They are rather to be applied flexibly according to circumstances; their order may vary, and alternatives are available at every step" (Strauss & Corbin, 1990, p. 59).

The focus is on events (i.e. individual instances of behaviour, or action occurring within a given situation) and phenomena (i.e. situations and elements which occur in specific contexts). They are subject to interaction within many levels, involving both individuals and groups (Strauss & Corbin, 1990). Grounded Theory maintains that individual phenomena exist in a transactional system, manifesting through related interactional sequences and embedded in dimensional sets of conditions. These conditions can be causal, contextual, temporal and/or intervening. The consequences of these related interactions are ever changing, because the matrix of properties is changing as new data emerges, and the environment from which the data is collected changes. Grounded Theory can accommodate for the change, which is thus its strength. "One of the methodology's central features is that its practitioners can respond and change with the times - in other words, as conditions that affect behaviour change, they can be handled analytically, whether the conditions are in the form of ideas, ideologies, technologies, or new uses in space...not to remain open to such a range of questions is to obstruct the discovery of important features of power in situ and to preclude developing its further conceptualisation" (Strauss & Corbin, 1994, p. 276).

Glaser and Strauss (1967) suggest that four basic criteria determine how substantial a theory derived in this manner will be. They are a) fit, b) understanding, c) generality, and d) control. These are directly linked to the reliability and validity of the data and its analysis.

Reliability and validity

Qualitative methodology requires a different approach to reliability and validity of the research process and findings. In qualitative research, reliability is largely dependent on the credibility/integrity of the researcher and how the research is conducted. The need to be able to replicate the research is not so stringently demanded, because of the idiographic nature of

most qualitative studies. Notwithstanding this, there is a need to have the procedures clearly laid out by the researcher, in an audit trail. This enables readers to examine the method of the study and to replicate it, because it is clearly defined and in considerable detail. There must be a rigour and expertise in the research process which can be scrutinised.

Maxwell (1992) has offered four categories for determining validity:

- 1) *Descriptive validity* involves the accuracy of the account given by the researcher. This requires a combination of understanding, skill, expertise, good writing skills, and honesty.
- 2) *Interpretative validity* is based on empathy and understanding of the language and behaviour of the participants. It is through language that they interpret their own environment and then relay this to the researcher.
- 3) *Theoretical validity* refers to the validity of the concepts as they are applied to phenomena and to the validity of postulated relationships and categories amongst the concepts.
- 4) *Generalisability* refers to the extent to which the account given of the data can be generalised to other data and contexts. Qualitative research relies on case-to-case translation, which is acceptable, providing the researcher produces sufficient descriptive data and valid interpretation (Firestone (1993). Building up large amounts of evidence over time makes it possible to produce systematic understanding of phenomena at a wider level than the original case studies (Crozier, 1981). The transferability of that understanding to other cases then lies with the reader. Accumulation of independent results from such studies produces identifiable patterns which may in time indicate a greater degree of generalisation, and the object of the exercise is then largely achieved. To look for generalisation after a single research endeavour is an expectation beyond the designs of qualitative methods such as Grounded Theory.

Owens (1982) suggests that there are a number of techniques which can strengthen the validity of the research findings:

- It is important to spend as much time as possible in the field prior to gathering data.
- Triangulation is very useful where it is possible.
- Checking interpretation of data with participants establishes credibility.
- Corroborating findings with referential material collected on site is worthwhile.
- Detailed description is important.
- Peer consultation on findings and interpretation are of great assistance.

Triangulation

Denzin (1989) suggests that triangulation is an alternative to these strategies for validation. He offers four major techniques for thorough triangulation:

- The use of data from several data sources.
- The use of several different researchers.
- Interpretation of data from different perspectives.
- The use of several methods to study the same issue.

Mathison (1988) and Miles and Huberman (1994) argue that triangulation offers the opportunity to substantiate interpretation. This comes via convergence, contradiction or inconsistency.

Procedure

Regions

It was decided that all regions in New Zealand could not be covered in this study because of time and cost constraints. Three areas were chosen which would give a wide coverage of the different conditions and operations in New Zealand logging. These were the Far North, the Central Plateau, and Manawatu\Southern Hawkes Bay. The Far North has a medium to high accident rate. It has a high proportion of woodlot crews and has a very young logging industry. It thus represents the developing forest scene in New Zealand. Manawatu\Southern Hawkes Bay has some older established forests and some newly developing areas. It has a medium accident rate. The Central Plateau has an old established forest industry revolving around the large companies. It has a very low accident rate compared to the rest of New Zealand (Bell, 1996). The lower accidents rates there could give some important information for the rest of the industry.

The fuller description of each region in chapter three records important features which highlight their differences. The variations between and within the regions facilitated gaining diversity of data.

Participants

Seventy nine loggers were interviewed from the three areas. Of these, thirty two were contractors and forty seven workers. All were male. Twelve Far North participants gave follow up interviews, that allowed the investigation of themes which had not emerged until

later stages of analysis. Additionally, three workers and two contractors from the Far North, three contractors and three workers from the Central Plateau, and two contractors and three workers from Manawatu/Southern Hawkes Bay were contacted informally later in the analysis stages of the study, to allow continued contact with the industry and any important developments taking place.

Strauss and Corbin (1990) note that it is important to select participants who will represent the phenomenon which is to be studied. The participants in the study were chosen to get good coverage of crews working in a variety of different operations. With the assistance of members of the local Forest Industry Training groups (FITAGs), as well as other industry figures who had a knowledge of the diverse workforce and crew operations, a list of crews was drawn up for each area. Criteria were :

- A variety of different contract types.
- Range of safety levels.
- Range of crews, from those deemed to be badly run through to those seen as well run.
- Crews which operated in a variety of physical environments.

All of the criteria were subjectively determined. For instance, whether a crew is run badly or not is at least partly perception. On the other hand, the industry personnel who advised me had very good contacts with crews in the area and had been to most operations many times.

The list initially included twelve contractors for each region, and in all instances they agreed to assist in the study. In the process of the visits to each region, two contractors from Manawatu/Southern Hawkes Bay and one each from Central Plateau and Far North withdrew from the study. No reasons were offered, other than that they no longer wished to take part.

Each contractor was contacted by the present researcher and a visit to the workplace organised wherever possible. Observations were made in each logging operation, notes taken and discussion initiated with workers about roles in the operation. In some instances, photo records were made. During this time, permission was gained to discuss the research being undertaken with the workers. The interviews were the main source of data. Wherever possible, workers from various roles in the operation were sought, to give a wide coverage of logging jobs. Each logger who expressed interest in the study was asked for a contact telephone number.

Workers

Workers who had given telephone numbers were contacted, after they had had time to consider the project. Eighteen workers from both the Far North and Manawatu/Southern Hawkes Bay agreed to participate, but, subsequently, three from each region withdrew. Twenty two from the Central Plateau agreed to participate, but four were not available when the interview time arrived. If permission was given for an interview, a time was arranged, and a suitable venue organised. In all except eight instances, this was in the interviewee's home. In three cases the interview took place in the researcher's home, in three cases at the work place with the aid of a portable tape recorder, and twice in an office. In summary:

- 15 workers were from the Far North - 6 worked for companies and 9 for woodlots.
- 14 workers were from Manawatu/Southern Hawkes Bay - 7 were from companies and 7 from woodlots.
- 18 were from the Central Plateau - 15 worked for companies and 3 for woodlots.
- The average age of the workers was 28.
- Ages ranged from 17 to 56
- Average time in logging was 9.8 years, with a range from less than one year to thirty five years.

Contractors

The same procedure for interviewing was used for the contractors.

- 11 were from the Far North - 6 were woodlot contractors and 5 company contractors.
- 10 were from the Manawatu/Southern Hawkes Bay - 5 were company contractors and 5 were woodlot contractors.
- 11 were from the Central Plateau - 9 were company contractors and 2 were woodlot contractors. (This variation reflects the different ratio of woodlot to company crews in each region).
- The average age was 41.
- Ages ranged from 32 to 59.
- Average time as a contractor 11 years.
- 5 of the woodlot contractors operated without crews. 3 of these were in the Far North and 2 in Manawatu/Southern Hawkes Bay.
- The smallest crew size was 3 and the largest 20.

- 1 Manawatu/Southern Hawkes Bay crew and 2 crews in Central Plateau were hauler operations. The rest were ground based operations.

Before each interview, an information sheet (see Appendix 4) was given to the logger. Some chose to read this by themselves, but others were happier to discuss it with me. This information sheet contained the aims and method of the study and areas of interest. I also gave a brief background of myself. When the participant was happy with the procedure, an informed consent form was signed (see Appendix 3) and permission was also obtained to start the tape recorder.

At the beginning of each interview, I asked the participant basic information about himself, including age, time in logging and how he had become involved in logging. This opened out the interview to a variety of topics, and as appropriate moments occurred, questions were asked which allowed the interview to track along given themes. I used my knowledge and growing understanding of the industry to focus on issues but at the same time attempted to ensure the discussion ran with as much freedom as possible.

In keeping with the methodology, I monitored my own contributions to the discussion, ensuring an empathetic style of conversation and use of language. Participants responded best when the discussion flowed informally. Thus, while inevitably I did adopt a questioning role to a certain extent, the questions were embedded in a conversational tone. Consequently it became difficult at times to ensure the interview covered all the relevant areas. Loggers work long hours and because it is impractical to interview them on the job the only time available is in the evenings and weekends. It is not always possible to obtain a time which allows for long interviews. An hour in total, including the introduction to the interview, was often all the time a logger was able or willing to contribute.

Contractors tended to be willing to talk for longer, and also tended to be more forthcoming in their opinions about a greater variety of issues. This may have been partly because they are older and have had more experience on average than the workers. It may also reflect a sense of self efficacy. Contractor interviews were generally between an hour and a half and two hours long. Worker interviews were usually forty five minutes to an hour and a half. Consequently, more themes could be discussed and in more depth with the contractors.

Moreover, because the contractor had more dealings with issues beyond the immediate workplace, they were more likely to have a wider understanding of the whole industry.

To overcome loggers' suspicions of possible repercussions involved in expressing their opinions too openly, the following procedures were followed:

- Verbal assurance that all interviews were confidential and would only be read or listened to by me.
- Participation in smokos to increase familiarity.
- Several visits to workplace where possible, with informal conversations with loggers on the job.
- Rapport building through discussion of issues unrelated to logging.

At the end of the research period, each participant received a Summary of Findings letter (Appendix 5) This gave an overview of findings of the research. It was written in language compatible with that generally used by loggers. The participants were offered the chance to telephone and discuss anything of interest.

Analysis

Coding

In Grounded Theory, the data is broken down into component parts, conceptualised, and then reassembled. This is done by coding the data at three levels: open, axial, and selective. As the coding reaches higher levels of analysis, the most relevant data become the focus. In the final analysis, a core category is discovered through the use of a paradigm model, as suggested by Strauss and Corbin, (1990). There are six components to this :

- 1) Causal conditions - which cause the phenomenon to occur.
- 2) Phenomenon - the object of the investigation.
- 3) Context - the set of conditions in which processes surrounding the phenomenon occur.
- 4) Intervening conditions - structural elements which create an environment where action and interaction can occur.
- 5) Actions and interactions - activity related to the phenomenon.
- 6) Consequences - outcomes of this activity.

A computer programme for assisting in the organisation of qualitative data was used (NUD.IST). In NUD.IST coding is done via a numbering system. For instance, in the theme

grouping which relates to the selective code “Reasons for becoming a logger”, the coding looks like this:

Selective code: Reasons for becoming a logger: ‘1’.

Axial Code

Open code

1.1 Non-specific reasons

1.1.1 There was really little or no choice in jobs

1.1.2 It’s just a job

1.1.3 I thought it would be a great job

1.2 Way of life

1.2.1 I liked the idea of the general lifestyle

1.2.2 I wanted the adventure

1.2.3 I wanted risk

1.2.4 I liked the idea of freedom and the lack of restrictions

1.2.5 I liked the idea of hard physical work

1.2.6 I liked the idea of driving that sort of machinery and/or that type of operation

1.3 Self image

1.3.1 It was just in my blood

1.3.2 I wanted to be a logger like in the old days

1.3.3 It’s a tough macho life that I wanted

1.3.4 I wanted skill prestige and pride

1.4 Rewards

1.4.1 It’s good money

1.4.2 Hours worked

1.5 Need to Belong

1.5.1 I went to be with my mates

1.5.2 I liked the idea of being part of a close team

The process of identifying codes begins with open coding and builds towards selective codes. This sequential process is described in conjunction with the analysis procedure of the present study in the following section.

Open coding

To begin the process of analysis, the first five interviews were listened to, and then transcribed. Basic open coding then began. The accumulated data was broken into small pieces. They were then grouped according to their properties and dimensions. Thus, individual items such as 'I thought it would be great working outdoors', 'I didn't want to be tied to working inside a building' and "I like the idea of working out in the open in the bush' might be coded to fit into an open code labelled 'I liked the freedom and lack of restrictions'. All phenomena were recorded in note form and listed on a new file. When all five interviews were covered, the notes were printed out and cut up, so that each phenomenon was on a separate piece of paper. They were then grouped according to similar properties and dimensions, and each group labelled as an open code. The groupings determined by open coding became the basic building blocks of theory (Swanson, 1986). From the five interviews, more than fifty codes emerged. The reassembling of the fragments of data enabled different perspectives and new insights to be gained from comparison, contrast and synthesis. Analysis thus moved from the empirical to the conceptual (Glaser, 1992).

However, there was the deliberate intention of remaining open and flexible about the initial coding because with a further seventy four interviews to be carried out in three distinct geographic areas of study, anything more than tentative coding could narrow the focus of the research too early in the process. The interviewing process continued through 1996 and 1997 and early 1998. Code definitions evolved and became clearer as the data was compared. The data continued to accumulate and be reassessed. New properties of the codes were defined and old data analysed in that new light.

The memos, which are an essential part of the analysis, had now begun, in conjunction with the open coding. Strauss and Corbin (1990) note that neither differentiation between the elements of the paradigm nor an obvious sequence from cause to outcome will necessarily be clear-cut. However, they stress that it is still important to attempt to steer analysis via the coding model, using memos to gain clarity and insight. They maintain that using memos throughout the analysis keeps track of the elements and ensures the totality of triadic analysis: data collection, data coding and memo writing. They enable fresh understanding and provide material for discussion and revision. The use of memos is particularly helpful in developing axial and later selective codes and in ensuring verification of emerging theory. In these ways, memos are critical to theory building (Hutchinson, 1988). Investigation of other material

which assisted in understanding the logging process included video tapes, books, documents and memoranda which were gathered from various sources in the industry.

Verification is a driving force in Grounded Theory. Previously established codes are confirmed or negated by the newly emerging data. As each interview is analysed, themes strengthen or diminish in importance. Data may fit into several open codes, depending on the paradigms. Over time, some are amalgamated. Towards the end of data collection and into data analysis beyond that phase, integration increases in purpose. As verification continues and codes are established, so memos, notes, discussion and revision enable the development of axial groupings.

Axial coding

Axial coding is the analysis of all data which revolve around a single axis. Relationships between open codes are sought which link them either causally or contextually. Links may also be seen as intervening conditions, as action or interaction, or as consequences. This emphasises a concern with social process, rather than structure (Strauss, 1987).

Links between open codes include causal conditions, context, interaction between people, strategies, tactics and consequences. Conditions are notions associated with words like 'since', 'as', 'because', 'when', and 'if'. Consequences relate to words like 'the result was', and 'because of this'. Strategies and tactics are those interactions which lead to consequences. Axial coding is analysis of a single category at a time, accumulating knowledge about the conditions, consequences, tactics, and/or strategies which link phenomena and also divide it into subcategories which may or may not have overlapping strands. The links tend to be circular, which makes it difficult to clearly separate influences or establish any linearity. In the present study the open codes were connected into categories with similar links and interactions. For example, the axial group describing loggers 'self image' included as open codes: 'it was just in my blood', 'I wanted to be a logger like in the old days', 'it's a tough macho life that I wanted', and 'I wanted skill prestige and pride'. This grouping was achieved by comparing and contrasting the codes, developing loose groups, merging some that were not distinctly different and in some cases separating groups which were too broad. Between the axial codes some overlapping occurs. For example, 'I like hard work' overlaps with the 'it's a tough macho life that I wanted'.

As axial coding continued, hypotheses began to appear. For example, early in the analysis a strong desire amongst loggers to develop a professional status emerged as an hypothesis. However, as different crews were interviewed and as conditions changed, other opinions were expressed and different agendas implied. The emphasis on professional status declined as new issues gained prominence, and the hypothesis was reduced to explaining particular conditions and contexts, rather than covering the whole industry and all the participants in the study.

Analysis of the final interviews, including the follow-up interviews, were completed by early 1998. Contact was kept with several of the workers and contractors and issues discussed and confirmed. This continued until the beginning of 1999. This helped clarify any issues which were unclear, and also helped me to keep abreast of ongoing developments in the industry. All of the interviews continued to be listened to and the transcriptions read many times by the researcher, so that adjustments could be made to analysis, new understandings developed, and new links made.

As analysis continued, axial codes became more defined. These were used as a basis for the rest of the interviews. Once this clearer picture of themes had been gained, it was decided that twelve of the Far North interviews should be followed up. This was to ascertain whether issues not covered in those earlier interviews which had now been identified as important to the analysis had previously been overlooked, or had only emerged recently. When all the interviews had been dissembled and coded into, first, open codes and then axial groupings some tentative themes became more prominent and clearly defined, and these developed into selective codes.

Selective Coding

This coding occurs at a more abstract level. The lower level axial codes are related to this level in much the same way as the axial codes link open codes. In the traditional approach to Grounded Theory analysis, it is at this point that the core categories begin to emerge. Indicators of what might become core categories emerged early in the process of the present analysis. Through selective coding, the core category or categories were identified. By linking the components of the processes operating between axial groups, the core categories were selected. Thus, the axial groups 'self image', 'way of life', 'need to belong' and 'material rewards' contributed to the selective code 'reasons for becoming a logger'

The complexity of this study was such that it was difficult to locate and place as paramount a single category. Though core categories had already emerged through the tentative initial analysis, new focus shifted the emphases within these categories in the latter stages. Thus, while new core categories did not develop, a qualifying influence altered the manner in which each core category was considered.

From these, a clear theory began to emerge. Initially the five themes (leadership, motivation, learning by experience, learning through formal training, and regulations) retained equal focus. Later interviews tended to give more emphasis to some themes than others. The changing state of the industry impacted on loggers over the span of the data collection, so that final interview data was partly influenced by these different issues. The follow up interviews of the Far North loggers confirmed this change. The rapidly changing state of the industry emphasised the role of the contractor. Because this emerged as such a dominant issue, all the themes identified earlier were reanalysed in terms of how contractorship impacted on them. Open codes were reassessed and many discarded as only peripheral to this narrower focus.

A list of the final open, axial, and selective codes is attached to the report (Appendix 6). While they are set out lineally, the positioning of each open and axial group is better seen as in multi-dimensional proximity, rather than uni-dimensional. Codes relate to each other in a non-linear fashion, but some are more closely linked than others; hence the grouping into axial codes.

In Chapters Seven to Eleven, the results of the main analysis are presented. However, prior to this the researcher's previous experience and knowledge are presented.

Previous experience and knowledge.

I developed the present study deliberately drawing on considerable knowledge of the industry. My family has been involved in small scale logging and milling for three generations. My father, like the contractors I interviewed, worked alongside his employees.

I have worked in the mill and the bush, grown and harvested trees and lived in communities with a forestry focus. The community in which I was school principal for nearly seven years had a large proportion of forest workers. The demise of the New Zealand Forest Service brought a huge change to employment in the community. Prior to the break-up of the Service,

there had been 90% employment. This changed dramatically to about 80% unemployment as workers were laid off. The subsequent repercussions were wide and severe and I developed sympathy for the community and the difficulties it suffered as a consequence of the lay-offs. This knowledge and experience, coupled with the ongoing accumulation of further knowledge via the research being conducted, implicitly impacted on the analysis of data, bringing possible biases to the research. These no doubt affected my interpretation of events occurring currently in the industry, but they also provide a level of understanding which can enhance analysis.

Any researcher inevitably brings previous knowledge, unconscious and conscious hypotheses, subjective interpretations, and probable moral biases, to the study. The degree to which such prior knowledge handicaps the study varies, but it can be of benefit. Researchers are encouraged to steep themselves in the culture of the place and, rather than being detached observers, are participants in the culture. While this will still present a particular perspective, it is a participant's point of view, rather than a detached academic observer's observation. Nevertheless, the researcher must be continually aware of the possibility of bias, and assess all analyses with this awareness.

Before discussing the main results Chapter Six looks at the reasons why participants say they became loggers. This is an important precursor to the main analysis, because it sets the scene for interaction within the crew. This aim of the chapter is to give insights into the sort of people who make up logging and what perceptions they have of risk, safety and associated elements of the workplace. It is important to understand that loggers do not come to the workplace as blank slates, and thus, while the workplace environment affects them, it is not a one way process.

Chapter Six

Reasons for Becoming a Logger

This chapter is designed to provide some insights into the kinds of people who are likely to become loggers. Since logging is a physical job which requires a desire to work outdoors in a demanding environment, there may be certain types of people more likely to want to be loggers than others. This may have implications for safety. A logger brings with him beliefs, attitudes and perceptions mediated through prior experience. Most contractors were once ordinary loggers, with similar backgrounds. They may understand, empathise with, and often facilitate a continuation of the beliefs, attitudes and perceptions which in turn affect safety behaviour in the forest.

Research has shown that attitudes and individual and group characteristics can impact on safety (Mohr & Clemmer, 1988). Safety attitudes have been found to help identify individuals who take risks (Boye et al., 1990). Chappelow (1989) supports this with a study suggesting that social maladjustment, aggressiveness, anxiety, excitement seeking and recklessness may contribute to accident levels (Glendon & McKenna, 1995; Hansen, 1996). It has also been suggested that the socio-economic position of workers affects risk-taking behaviour (Abdalla et al., 1997; Aberg & Rimmo, 1998). Abdalla et al. found significantly higher casualty rates in deprived populations. Although there have been studies claiming that 'characteristics' and traits do not contribute to accident levels (Leigh, 1986), given the incidence of fatalities and injuries sustained by young male drivers (e.g. McKenna, 1987), it is difficult to dispute the assertion that there is some relationship between different groups and risk taking. There are certainly studies which suggest that industrial accidents have a link with certain characteristics such as sensation seeking, which are claimed to have a biosocial basis (Boyle, 1980; Jonah, 1997; Zuckerman, 1994).

Reasons why people become loggers was identified as a selective code, and can be divided into five axial codes or properties: **non-specific reasons, way of life, self image, rewards,** and **need to belong**. These axial groupings are derived from the open codes elaborated below.

Non-specific reasons

- *It's just a job*
- *There was really little or no choice in jobs*
- *I just thought it would be a great job*

It's just a job

A growing proportion of workers saw logging as 'just a job'. *"I've been logging since I left school and I wanna break ... I only really went into it because it was a job - I never really had any keenness to get into it or anything."* Contractors who employed such workers said they generally did not stay long in the job and could just as easily have been in a different occupation.

There was really little/no choice in jobs

Some loggers said they took the job because there was little choice. *"I've known guys who've been in jobs for 40 years and they hate the job from day one yet they're too shy to try something else...or they think they had no choice but to go logging. They knew nothing else ... the same job for 30 years and when they get the punt [sack] they know nothing else."* Loggers could feel trapped once they entered the industry because of a perceived lack of choice and the fact that they did not have any desire to be loggers.

I thought it would be a great job

At the other end of the scale were those totally enthusiastic about all aspects of the job. This general keenness to become a logger probably derived from a combination of elements such as the way of life, self image, rewards and the need to belong. These loggers did not specify, even when pressed. It may have been that all positive aspects of the job were equally important to them.

"Interviewer: What did you think you would like about it?"

Tom: Ohh, I don't know the - everything, the whole lot. I like the work."

Points of discussion

The present study found workers with little enthusiasm for the job were entering the industry in increasing numbers. Perhaps the romance and ideals of old style logging have diminished, as was maintained by some participants, or they no longer had the same appeal. Workers with

little ambition might not strive to become skilled, or be inclined to stay long enough to gain requisite skills and understanding of safety. They could possibly be difficult to integrate so that the crew worked harmoniously and safely.

Generally, loggers entering the workforce had some idea about what conditions would be like. Where work was scarce, such as in the Far North, it was likely that more workers entered logging because of limited choice. Dwyer (1991) implies that where workers see little choice but to accept a job despite being aware of poor conditions, voluntary servitude may develop. Such acquiescence, which can lead to acceptance of less than ideal conditions, often has its origins in the culture of the community as well, and is determined before the worker even joins the workplace.

When a person was positive about becoming a logger, good relationships within the crew were likely to be facilitated, especially with the boss. Wholehearted enthusiasm for the occupation meant workers strove to become skilled and competent. It could even mean less dissatisfaction with routine work, disorganisation and lack of training, provided there were no expectations of these. On the other hand workers could become disillusioned should conditions conflict with the ideals they brought to the job. How that affected accident levels depended on the synthesis of this individual level and the tasks and relationships in the workplace.

Way of life

- *I liked the idea of the general lifestyle*
- *I wanted the adventure*
- *I wanted risk*
- *I liked the idea of freedom and the lack of restrictions*
- *I liked the idea of hard physical work*
- *I liked the idea of driving that sort of machinery and/or that type of operation*

The six open codes within 'way of life' are very closely linked and in many respects overlap. However, the separate codes have been retained because some loggers were quite clear in specifics such as 'adventure' whereas others were clear that it was the total experience of the way of life and all that it embodied which attracted them to logging.

I like the idea of the general lifestyle

More loggers said they chose the job for the general lifestyle than any other reason. As noted by Phillips (1987) the bush is part of New Zealand's 'mythical' tradition of an outside, healthy, rugged, physical existence. *"Some days [we felled] one log a day because they were so big, kauris and kahikatea. I was pinching kauris and kahikatea out of the state forest till a couple of years ago. It's like an adventure ... it's a good life style... it's good fun, that's what I like about it."* The job itself and the environment in which it takes place held appeal and this made logging unique.

I wanted the adventure

Adventure seekers did not necessarily seek danger or risk. They sometimes simply liked the idea of going off to new places, taking part in escapades, seeing big trees crash to the forest floor, driving big machines and so on. *"Well when I first started I was looking for a bit of adventure, I spose. I was wanting to get some action, I think like even some danger, but more just adventures out in the bush. Hoping to find giant trees to cut down."* The job could produce unexpected and exciting situations which could be dangerous, even if the loggers did not recognise that danger. When a logger saw such situations as adventurous, rather than risky, he could be less careful and take fewer precautions.

I wanted risk

"I guess I wanted a bit of excitement, like I always was someone who could take a few thrills, especially when I was young. Me and a mate used to go out hunting a lot and see the big trees being cut down - boom! It was great. We used to sort of go closer than we should have - you know, dare each other see who could be nearest where it fell. For a laugh. Silly I spose, but it was a buzz, so I thought I might like to do it for a job." The initial expectations and perceptions of the new worker were contingent on previous experience and input from beyond the workplace.

The systems of a very structured, predictable operation may require a greater acceptance of more routine work. Company crew loggers had to accept more conformity on the job, imposed by the companies and their boss, who in turn had to conform to remain with the company. *"See I looked at the old days of logging when you were a real man with proper trees, not these match sticks, and that's what I would have liked to do. Times when I've ended up with no choice but to go work in one of these company operations where you just*

stand on the skid trimming sticks off the logs all day. That's no work for a man. It's simply boring and you may as well work in a supermarket." Closer in some ways to a factory type job, the appeal might lessen.

Freedom of the outdoors and the lack of restrictions from regulations

Most loggers disliked inside work, and too many structures and restrictions. *"When you're out there in the bush it's better than in town in a building like a prison... I love the outside of the bush. All my life has been built around the outside stuff: hunting, fishing, diving. I couldn't go back and work inside. I'll be in the bush till I finish."* The notion of hunting, fishing and diving were often related to bush work. It was seen as a man's job, and antithetical to a job in an office. *"The son just loves the life... loves pig hunting and being up in the bush... like you'd have a job getting them into a tuxedo or suit. They love being out there where she[sic] changes all the time - every week or so it's a new block, and they love it."* It was implied that inside jobs were restrictive and boring.

The link between freedom from restraint and opportunity for challenge was important. *"I like the challenge especially in the tough country ...I gotta just go up in the hills and try to ignore these bureaucrats... And you don't have some bloody suit telling you how to do it. You learn as you go. None of this bloody training bullshit. That's why I went to the bush. That sort of freedom you know."* The desire for challenge goes back to the days of indigenous felling, when a tree could weigh fifty times as much as a plantation pine. Where workers retained this desire there could be conflict with the new rules that the contractor, company or OSH might wish to impose on the workplace. Contractors often sympathised with workers who had a desire for 'freedom'. They sometimes accommodated that need in the way they ran the operation.

Coupled with the desire to work outdoors was the desire to be free of rules or regulations. *"Make you wear this and do that. It's pathetic. It's why I never took a job inside, you know. Half these OSH wallahs sitting in their offices wouldn't know the arse end of a skidder from their grandmother. The last thing I wanted when I got into logging was a whole lot of rules."*

I like the idea of hard physical work

Working hard was often perceived as manly and was bound up with the willingness to take risks to prove that manhood. *If you haven't got the stomach, you'll never make a good bushman. It's no sissy thing out there you know, it's full-on work, and at the end of the day you know you've been working.* The implication was that as a logger you must be able to live with high levels of production and danger.

Hard physical work could be demotivating or motivating, depending on the person. In many instances it was a test when a logger first started work, before he had time to become used to the demands of the job. Hard work could quickly sort out those with a strong desire to be a logger. *"A log driver come out here. He had the fancy boots on, body builder. Big strong kid, or he thought he was. Anyway he went down the hill and ... he come back up at lunch time and said 'Ohh, fuck this, I'm outta here,' and I said 'Ohh, finish the day up, and I'll pay you,' and he said, 'Ohh, fuck that, see that red logging truck, I'm on that now.' and he grabbed his gear and he was gone. Too tough for him - some of these guys can't hack the hard work."* For those who stayed in the industry, such incidents were evidence of their ability to handle the extremes of the job. If a new logger tried to avoid danger; perhaps applied the cautious measures suggested in the bush code, there would be contempt from workers such as this. Such situations were more likely in woodlot crews, which did not have the tempering effect of company rules and supervision.

I liked the idea of driving that sort of machinery and/or being in an operation like that

There was a wide range of operations both in terms of machinery used and systems in place. On-board computers on mechanised harvesters, computerised log makers, and hydraulic loaders were increasingly part of many operations. With large amounts of capital invested in such equipment, the crews needed to be systematic and efficient, and the systems predictable and fully operational. Such a working environment appealed to a different type of logger. Young aspiring loggers might strive to become machine operators, and deal with computer associated gear. In woodlot crews there was less mechanisation. Machinery was less sophisticated and of poorer standard and condition. The use of machinery in woodlots was likely to be more spontaneous and less organised. It was closer to the idea of 'the big sand pit' which loggers sometimes referred to. In the woodlots it was apparent that there was a greater element of fun and adventure, of adult play, attached to driving machines, and in fact in all aspects of the operation. Loggers still sought work of this nature in the woodlots. If they tried

the more organised company crews they could quickly get bored and move to the woodlots. *"I thought I'd like working on a machine... like, I wouldn't want to work on a saw... Dad had a digger, and I just sort of hopped on when I was about 14, and Dad just taught me how: 'Get on, boy, and drive it.' I wouldn't want anything else... I like driving machines, wheel loaders... Every machine is different ...If I couldn't be mucking round on machines, like doing all sorts of stuff, I may as well not be in the bush."*

Points of discussion

Crews working in more varied, difficult, less organised blocks were more likely to have workers attracted by the ideal of the lifestyle inherent in traditional logging: fresh air and the outdoors, lack of buildings and other confinements, adventure and excitement and even the risky nature of more difficult jobs. In some cases, individuals came from thrill seeking, or risk taking backgrounds. Coggan, Disley, Patterson and Norton (1997) found, in a study of young New Zealanders, that a large proportion of them indulged in risk taking behaviour and those who left school early were most likely to take risks. Further, these researchers found that young Maori were more likely than Pakeha to take risks. This is relevant, because a large percentage of loggers are Maori. Coggan et al. point out that risk taking is probably a socio-economic rather than ethnic link.

Some logging operations, particularly company crews, had become more routine through efficiency and mechanisation. This attracted people with a more modern 'professional' approach, while the unpredictable woodlot crews continued to attract adventure seekers. The fact that the job had become more factory-like might not necessarily change the sort of person available as labour, and these workers might introduce excitement into the work themselves. Wilde, in his theory of risk homeostasis, maintains workers may seek risk for stimulation and that some people have a higher threshold than others (Heino et al., 1996). However, loggers with a propensity for risk taking were likely to go into crews where there were fewer restrictions imposed on their behaviour.

An evolutionary process of 'professionalisation' of the mainstream crews meant there was less opportunity for adventure seekers and risk takers. Many loggers still hoped that by finding a new crew they would retrieve the adventure and mystique of the old bush days. They felt that by acquiescing to the new demands and restrictions they were losing their sense

of identity. Moreover, contractors could place pressure on workers to work hard and in dangerous conditions by appealing to their desire to maintain this sense of identity.

Self image

This axial code comprised four open codes:

- *It was just in my blood*
- *I wanted to be a logger like in the old days*
- *It's a tough macho life that I wanted*
- *I wanted skill prestige and pride*

It was just in my the blood

Forty three of the seventy nine participants had connections to the forest through their families. The majority were from the Central Plateau, and most of the remainder from Manawatu/Southern Hawkes Bay. Those from the Central Plateau were likely to have had a family background related to the big companies or New Zealand Forest Service, whereas in the regions, it was likely to be in woodlots. Some loggers, and particularly Maoris, contended they had a natural affinity with the bush: *"It's in the blood, it's an automatic connection. I think if you were to ask a Maori he'll say that's culture."* In many cases loggers said that they went into the bush without considering other options. They felt they had always been destined to be bushmen. One young logger who was brought up in Auckland epitomised this belief: *"When I was a kid... I would watch the loader loading logs onto the ships. I left school but I was too young to go in the bush so I went and did other stuff and I forgot and then I came back here and did the course and it was my calling - in my blood."*

I wanted to be a logger like in the old days

The desire to be an old style logger usually included traditional attitudes about safety and training. Because there was no formal training, because safety was a 'common sense' thing, rather than following a set of rules or regulations, and because the old days are revered, modern approaches were often denigrated. *"I'd have loved to be back in the old days of logging - I was born way too late. They were what you called men...[I joined] probably one of the last gangs that was close to what it would have been in the old days...I loved the adventure, absolutely loved it. I think the old guys were there for that too. I don't know what it was but everything was big - like one of the guys had a huge truck - everything was big, the trees were big, the bulldozers were big, the chainsaws were big, everything was massive"*

and it was long hard days... I think they loved the old adventure and a lot of them didn't like working in the pine so that when we shifted over to that they just shot through it like banshees to get out of there and back into the native - it's a different sort of person - working with pine and working with native is like two different industries and people who say otherwise are not really talking sense. Native is a lot more laid back but extremely dangerous. And these regulations, they are not what make you safe. They might make you a 'yes man' but they just stop you getting on with the job." There was a link between the conception of a logger and adventure, the old ways and being a 'man' who achieved great feats, had enormous strength and skills, and used huge machines and equipment. The idealised logger of the old days was larger than life. There were few restrictions on him, and by implication, freedom from restriction was necessary if he was to accomplish these large tasks. Although it was acknowledged that this work could be dangerous, there was a belief that these old loggers could manage the danger.

It's a tough macho life I wanted

Both the notion of 'in the blood' and also 'the old days' had a link with macho aspirations. The traditions amongst farm workers, and the perceptions they held of themselves are similar to those found amongst loggers (Murphy, 1981). In logging, 'macho behaviour' thrived: taking risks with nonchalance, eschewing protective equipment, swaggering in a way to present an image of toughness and so on. It is an image often presented in blue collar jobs in connection with personal protective equipment (Feeney, 1986). Hopkins (1984) found similar behaviour in mines.

When questioned about macho behaviour and attitudes, many loggers suggested that they had never been like that. However, this tended to conflict with the behaviour I observed in the workplaces, particularly at smoko and when there were others around. This implied peer pressure but also that the notion of macho was relative. Swearing and posturing, spitting and strutting, and telling tales of disregard for one's own safety were relatively common in logging crews, regardless of whether loggers acknowledged it.

I wanted skill, prestige, and pride.

There was a desire amongst many who went logging to become skilled. This could be the skills defined by the more modern approaches in the industry, or it could be the old style skills. In both areas there was a certain prestige and associated pride linked with a skilled

worker. If they went through polytechnic, trainees progressed through the FIRS modules and were likely to see skills which included safety behaviour as important. Contractors who had accepted the new ways had no problems with course graduates, but some contractors, especially those in the fringe woodlots, denigrated the skills acquired this way.

Workers from courses were encouraged to view skills as inseparable from safety. They took such beliefs and aspirations with them to new jobs and sometimes found that they conflicted with the contractor's expectations. One worker, for instance, challenged the boss on the basis of what he had learnt at polytechnic and was abused and derided and finally assaulted. *"[At polytechnic] one of the tutors would tell you something and he always came out with safety in the end... when you are sitting General Requirements you have to do first aid and that, and, like you just, they drill that into you about safety... He [the new boss] reckoned Polytech workers...his attitude was that the way we were taught was wrong...I didn't want to do what he told me, 'cause it was dangerous, and then he just decked me, like that. Fuckin' hell, that was that. I was out of there."* Had this worker stayed, he would have had to change his behaviour, since the power balance almost always demanded that it was the worker who adapted to the contractor's expectations. Instead, he left and went back for an advanced course at polytechnic. He said that next time he would try to get into a reputable company crew where skill and safety were considered important. It was clear that pride and prestige for some of the younger loggers trained through FIRS was based on new beliefs and attitudes.

Mechanisation meant that the job of feller, where skill and bravery were most required, was being phased out in many operations. In the past, loggers desired to become a feller to gain the ultimate prestige. *"Working on the skids was the bum job, that was shithouse - if you could get in the bush and fall (sic) the trees you were top man - and then a job come up in the bush when one of the guys left so I went in the bush, and, basically, I hadn't fallen more than half a dozen trees before that, but, once again, just through listening to the guys and using a bit of common sense I managed and had a lot of narrow escapes, but it wasn't for any more money or anything, it was just to be able to say you were falling trees."* Nowadays, in highly mechanised crews there is less prestige in felling. The opportunity to fell huge, asymmetrical, heavily branched trees still existed in some woodlots and shelter belts.

Points of discussion

Most often it was those who had a family background in logging who felt it was 'in their blood'. There was an expression used amongst forestry people: '*saw dust gets into your veins.*' It was a common belief, and was usually associated with the traditional notions and values of logging. Those loggers, steeped in the ways of woodlot logging, incorporated such beliefs and values in their work environment when given the opportunity.

Crews with a reputation for having the most macho culture were well known. They were mainly woodlot crews, although companies were by no means exempt. Although the systems, safety, and general rules and regulations were somewhat antithetical to such cultural attitudes, in many respects the logging culture of the 'tough guy' precluded those who did not have at least some propensity for it from seeking work in the industry.

Recent changes in training seemed to have altered the basis for pride and prestige. The traditional fraternity and culture of the forest community offered prestige for skilled, experienced bushmen, who were brave and willing to take risks. With the arrival of safer equipment, more structured workplaces, and more predictable environments, the context in which 'manhood' flourishes had diminished. Safety and skill were seen as inseparable. However, although not all loggers had a self-image linked to the 'good bushman', most did see themselves as resourceful, skilled in difficult and challenging tasks, and tough; and, following the old traditions of logging, there was some acknowledgement that times were changing and that the old ways of logging were dying out. There is a certain irony that despite present day loggers' low place in the socio-economic strata, glamour was still associated with the industry because of the image of those old loggers and the role they had in developing New Zealand. They were an important part of our history. It was this image which many loggers sought. Though this self-image might be perpetuated or modified by the crew they entered, it also came with the loggers' preconceptions about the job.

Rewards

Two open codes made up this section:

- *It's good money*
- *Hours worked*

It's good money

"I think I went out in the bush because of the money - in Murupara some are just either on the dole or in the bush, that's all there is in Murupara." Logging still provided a better income than most other manual low skill jobs and certainly more than the dole. Most participants had something like lifestyle as their main reason, but that was usually contingent on the money being sufficient. *"Well, there is the money for sure, but I like the job as well, you know - outdoors, you either like it, or you don't as Don Howes said to me: 'You gotta be born for it. It's physical work.' There's no doubt about it, it's all physical and I've always been fit - fitness is my game, so I keep fit. So, okay, the money has to be there. That's an issue"*

When money was offered as a reason for becoming a logger, it seemed that the wages were compared with labouring, perhaps a trade, or factory work. Loggers accepted a certain place in the economic strata and work comparisons were made with others on that basis. Further, if the industry attracts itinerant workers from low socio-economic groups (as is noted by New Zealand Forest Service documents (AJHR) and perceived to be the case by many contractors in the present study), many loggers might stay insufficient time to accumulate safe skills and behaviour. As Iverson and Erwin (1997) point out, fitness, familiarity with conditions, skill levels and understanding of safety are likely to be affected by the amount of time a person stays in the industry.

Hours worked

Loggers also considered the hours worked. If loggers began work at six in the morning, they could finish work by two o'clock, yet often be paid until five o'clock. In the days of strong unions and more secure work, penal rates were paid. Increasingly loggers were working longer hours for no more money, and sometimes travelling considerable distances to get to work. This was emphasised by the accident in which three young loggers were killed on the way to work at quarter past four in the morning, in the Central Plateau in December 1998. The earlier starting times combined with later finishing times, had lessened the attraction of the job to those entering the workforce. Getting up early and travelling for up to two hours held little appeal when no overtime rates or extra pay were included.

Points of discussion

When money was better, as in the 1970s, wages were less of an issue, because it was assumed that pay would be adequate. More recently, pay had dropped relative to other jobs, hours had increased with no wage increase, and there was less security of employment. Prospective loggers might still seek the outdoors, the relative freedom, the macho image and so on, but the money must be adequate and regular, especially for co-operation to be maintained in the crew.

Need to Belong

The axial group was made of the following open codes

- *I went to be with my mates*
- *I liked the idea of being part of a close team*

I went to be with my mates

An abiding reason for young loggers going into the bush was to be with friends. Such a tendency was another way in which particular types of workers congregated in the industry and in specific crews. Often, contractors relied on their own workers' recommendations when a new worker was needed. More often than not they recommended their own relatives, friends and acquaintances. *"I had a mate who worked for Dennis and them, and I kept ringing him up and saying... 'Any job, any job?' while I was pruning for four months. Then he gave me a ring - 'There's a job here, there's a job here, start as soon as,' so I gave my notice at Jacob's Contractors and started with Dennis. He told Dennis I would be a good worker. See, he knows me from way back."* This contractor (Dennis) told me he had never advertised for a worker and never taken one from a course. He relied completely on word of mouth, mainly from his own workers.

I liked the idea of being part of a close team

The desire to belong to a close group still had some attraction for workers looking for a life in the bush. The New Zealand Forest Service had a sense of fraternity which engendered loyalty, teamwork and a sense of belonging. This is illustrated in books by Poole (1998), Allsop (1973), Halkett, Berg and Makrell (1991), and Kirkland and Berg (1997). That sense of fraternity had dissipated with the demise of the Forest Service, but traces of it remained in some crews: *"Anybody that wants to be a bushman has to enjoy it - I enjoy the money - but there is the people that I'm with and I enjoy being away from home away from the town,*

being out in the bush, and you know you're with a bunch of fullas working and laughing, you get to be close to them, get friends out there in the bush. As long as it's like that, I'll always be a bushman."

Points of discussion

Workers who went to the bush believing that there would be close relationships had suffered most with recent developments in the industry. Loggers reported that there was less camaraderie in modern crews, especially where there was pressure to produce. The close bonds fostered by traditional logging was disappearing, though these could remain in crews where the workers and contractor shared a sense of 'them against us' and saw themselves in opposition to the regulations and rules. Greater imposition of safety, training, and other standards was impacting on this.

General discussion

To gain an appreciation of safety issues in logging, it is important to consider why a person might become a logger. Intending loggers generally had a desire to be outdoors. This was often coupled with a liking for adventure and almost as often with a desire for challenge. Loggers did not necessarily feel there was danger if they were confident about pitting their skills against the elements. In many instances, the desire to fit an idealised image of a logger meant risk taking was viewed positively.

In the literature there are differing explanations for risk taking. The suggestion from Wilde (1982) that people have different comfort levels of risk could explain why the bush attracts certain types of people. It is not established whether risk taking and violation are physiologically or socially based. Zuckerman (1994) claims that sensation seeking has a biosocial basis. This implies that some people may be born with higher thresholds for excitement, but also that there may be social influences which modify this. Most research indicates that some groups, particularly young men, (Glendon & McKenna, 1989) are more inclined to take risks. The present data supports the research suggesting that different comfort levels of risk could be partly socially derived, since most loggers came from low socio-economic groups and many valued the rugged and risky lifestyle. Abdalla et al. (1997) found that people from lower socio-economic groups tended to seek more risk than other groups. They also maintained that low socio-economic groups had higher exposure to accidents. Similarly, Diaz and Cabrera (1997) found that some groups are likely to have higher levels of risk exposure

and thus desensitisation to danger. Because risk is linked to violation and accidents (Parker et al, 1995), there are implications for logging safety.

The perceived freedom of the lifestyle was also associated with avoidance or contempt for regulations. There may be a link between attitudes to regulations and the tendency to violation, especially amongst young men (Parker et al., 1995). Additionally, Reason et al. (1990) note that violation tends to decline with age and that men violate regulations more than women. However, Levenson et al. (1980) note that gender accident rates are confounded by differences in the type of jobs they seek. The average age of the loggers was twenty eight and there was a high attrition rate in the industry (Rowse, 1997). Thus while contractors struggled to come to terms with changes in the industry, and to implement such initiatives as a health, safety and training programmes, the sort of person entering the industry sometimes made the task more difficult.

Williams (1993) notes that logging culture has a strong 'masculine' emphasis and risk taking and proving oneself to one's fellow workers provides status. Loggers claimed peer pressure could override any values brought into the bush. They reported changing their risk taking behaviour when pressured by workmates. This supports McKenna's (1998) findings that young men drive more dangerously with peers than with young girls. Constant teasing and taunting took place in many crews. As McDaniels et al (1992) note, peer pressure is a powerful social consequence. Wogalter et al., (1989) found that even when non-compliance had a high associated cost, the consequences of peer pressure could override that cost and maintain risky behaviour. Macho behaviours were less likely from trainees who had been on one of the more comprehensive courses. In these courses, there was time to instil positive attitudes to safety and compliance with regulations, whereas learning in a crew tended to perpetuate entrenched values more readily.

The changes which had taken place in the industry, particularly in recent years, altered what it meant to be a logger, especially in company crews. The structure imposed on crews by companies tended to elicit conformity and thus to attract those who were prepared to abide by regulations. It may be that a different sort of logger was being attracted to company systems, including those to whom mechanisation and increasingly sophisticated machinery appealed. Those new loggers may have had less desire for risk and adventure and represented a workforce more amenable to formal training and safe behaviour.

There were also more pragmatic reasons which attracted loggers to the industry. The financial reward was important. Satisfaction with conditions could determine whether workers co-operated and worked well. This in turn could affect the crew culture, along with general attitudes and behaviour. The desire to be part of a close knit team assisted the contractor in developing good attitudes in the crew. Conversely, peer pressure of a crew with poor attitudes to safety may have had the reverse affect. Thus factors which influenced the decisions of people to become loggers were linked directly and indirectly to the safety culture. Attitudes new loggers had to achieving status via skill and qualifications influenced subsequent behaviour in the crew, and the extent to which a contractor could focus the crew culture on safety. This supports the findings of Weidner et al. (1998) and Wagenaar and Groeneweg (1987).

Nelkin and Brown (1984) note that people's expectations and needs are often changed by the workplace culture. They adapt their sense of risk, safety and self image to suit. Wilde (1982) too acknowledges the possibility that risk comfort levels can change through training, social pressure and new environments. Thus loggers coming into a workplace may change their behaviour, regardless of their initial expectations. It is important to consider this when analysing risk taking behaviour in logging crews.

Building blocks of a theory

- 1) Aspiring loggers represent a particular part of the population with characteristics which may affect attitudes to safety
- 2) They often seek adventure and risk
- 3) They also often dislike restrictions on their ability to do things their own way
- 4) The background of many loggers, such as family involvement in the forest, may impact on beliefs and perceptions they bring to the workplace which may in turn impact of safety
- 5) Many aspire to an image of a logger such as the traditional tough 'man alone' ideal
- 6) They like to be part of a close knit group
- 7) Such attitudes may affect the way loggers respond to training, regulations and expectations of companies
- 8) Since contractors are likely to be from similar backgrounds, in many instances they will have empathy with such attitudes.

Chapter Seven

Interpretation of Regulations

The 1945 Bush Workers Act contained regulations specific to forest work. They were prescriptive and defined the required behaviours and equipment for logging. The regulations needed little interpretation and loggers could be directly prosecuted. For instance they clearly stated that no worker should operate any kind of machinery in the bush under the age of 18. In keeping with the Domino Theory of accident causation, the theory in vogue at the time, the focus of blame was on the perpetrator of the unsafe act or immediate factors directly related to the accident, such as unsafe machinery. Production pressure or poor training were unlikely to be considered as possible contributors to accidents (Fielder, 1996b).

A review in the late 1980s produced a more generic Act (Campbell, 1995), the Health and Safety in Employment Act 1992 (HSE). The Act covered broad issues, including training and equipment use. These are then interpreted by each industry and specific work place. Within the loose specifications of the Act, a worker of 15 or over can be a logger, and therefore use a chainsaw, and drive a digger, skidder or bulldozer, provided they are trained or in training. What 'trained' and 'in training' mean is not clear (Fielder, 1998a). Consequently, present prosecutions under the Act are determined by case law. OSH officers prosecute if the Act is transgressed, usually when there is a serious injury or fatality. It is not the intention of the Act that prosecution should be restricted to accidents, but limited finances leave few resources for anything else, at least in logging. Bush inspectors report on accidents and refer them to OSH lawyers for possible prosecution. Since the outcome of the case sets a precedent for subsequent similar cases, OSH is circumspect about taking on marginal cases.

Interpretation of the Act is assisted by the Bush Code, which defines what is the 'industry's best practice.' For instance, it states that working within two tree lengths of someone felling trees is unacceptable. This is not a law, but a guideline for loggers and the bush inspector. It follows a similar structure to the codes of practice used elsewhere in the world in conjunction with generic safety legislation (e.g. Britain: Eisner, 1995).

Understanding the implications of a generic Act takes time and an appreciation of case law. The Act states that it is the responsibility of those in the organisational chain, from the

workers to the forest owner, to ensure workers are trained or in training for any task they undertake. Likewise, they must take all practical steps to minimise dangerous behaviour, equipment, and environments.

A key issue was what is considered 'practical'. Many industry people cited instances where a person had been deemed 'in training' simply because they have been given directions to do a job. The Logging and Forestry Industry Training Board (LFITB) FIRS programme had become a benchmark for 'adequate' training. If a worker was injured while felling trees, evidence that he had the 'tree felling stage two' module would satisfy the bush inspector that he was adequately trained. It became less clear when the worker was deemed to be 'in training'. The bush inspector was generally satisfied if it was clear that some attempt had been made to begin meeting and documenting the criteria in the skill booklets. If the contractor was not using any formalised training system, documentation was more difficult. Companies tended to insist that documentation was reasonably thorough and that FIRS was used, but there was not the same expectation of woodlot contractors.

This chapter contains analysis of phenomena and events which relate to the selective code: **Interpretation of regulations**. It is divided into five axial groups: **responses to the Health and Safety in Employment Act 1992, the bush inspectors, systems for implementing safety in the crew, influences which shape perception of regulations and the crew and safety**.

Responses to the Health and Safety in Employment Act 1992

Open codes from which this section derived were:

- *The January 1996 Forests Owners Association (FOA) policy statement*
- *Company rules and policies.*
- *Knowledge of regulations*
- *Changing perceptions of what the Act means*
- *Covering one's back*

The January 1996 Forests Owners Association (FOA) policy statement

The companies and FOA had legal advisers working within their organisations and were quickly alerted to the implications of the HSE Act. In 1994 FOA issued a policy statement that by January 1996 all workers in their forests must be trained or in training through FIRS.

Over time, the effects rippled out to much of the industry, although in the earliest stages it was largely a Carter Holt Harvey (CHH), Fletchers and Forest Corp initiative. The policy statement brought a substantial increase in formal training, mainly amongst company crews. The Logging Contractors Association disseminated its interpretation of the Act to its members, though not as immediately as FOA. The majority of members of this association were company crew contractors. It apparently took a lot longer for contractors in woodlots to understand the implications of the Act.

Early in the present study's research phase there was considerable talk, mainly in company crews, of 'professionalising' the work force by increased training, in part to meet the Act's requirements. *"The new health and safety law has put more emphasis on training and to get the responsibility on those people running the show to cut down the accidents, and if they can target all crews it will probably work, but only as long as the crews working for FOA are not the only ones taking the new attitude...it's good if we can get these young fullas seeing the job as a more professional occupation."* Fear of rising ACC levies coloured opinions about compulsory training and safety in company crews. Many loggers believed high levies resulted from 'cowboy' crews operating dangerously and having accidents. Mainstream contractors hoped that the new measures would force a change amongst fringe contractors: *"I reckon it's bloody good, cause it makes the fullas pull their fingers out [become more responsible and professional] or get out [leave the industry]... now you got a class of qualified operators in the forest and if they got all these modules, and they are doing everything right, it will make our ACC levies drop for sure and our accident rate come down."* Those on the fringes saw things differently. *"It comes down to production versus safety. Sometimes, unfortunately, we have to break the regulations. Don't get me wrong, the safety thing is a good thing, like I remember the old days when it was pretty hairy, like some of the vehicles didn't have brakes, and we were a rough and ready lot, and I think it's good, but I think the pendulum has swung too far, it's gone to almost the ridiculous like I can be prosecuted and the guy who owns the block can be prosecuted, because he hasn't got these guys in the right gear and stuff... it's a bit of a crazy law, I think, myself."*

Many contractors and workers, both from company and woodlot crews, believed that by becoming more professional and adhering to the regulations, they would ensure continued employment and preference in the tendering processes. *"See, what is gonna happen is those*

fullas who stick to the regulations and do the training are gonna be better off... That's with a good company, of course, but they don't want OSH beating on their door, so they will ensure that those who are legal and kosher will get preference in the tenders. It's all part of the big change in the industry. I'm sure it's them covering their own backs, but that's what it's all about."

Workers, though less clear about the Act and FOA directive, were aware of some of its implications. *"When you're in a gang you gotta have these strict rules to do with safety...See that's what happened with the OSH law coming out. It got these guys humming. They had the training up to speed. That's what they had to do...One minute everything is cruising along then we get the OSH law, and it's full on with all the correct equipment, all the tickets to get. And accident policies and all those things. Really we're just bushmen, but they seem to want to make us into tradesmen, which is a good thing, I spose, and then you will know your safety stuff."* The logger, though a little misinformed about the Act, noticed its affects on training and safety.

Not everyone was convinced the new regulations would benefit logging. Contractors struggling on the fringe areas of the industry were cynical, because they considered it only added to their problems. *"Like I read the OSH books, but they are a lot of rubbish. And so why are the companies pushing this stuff and trying to make us train and get into all that stuff? ... See, OSH is getting out of control...because all they teach you is you gotta wear all this gear, so you're that heavy in the bush you are unsafe ... And you gotta make money, or you shouldn't be there, and this OSH stuff is just making the bush unworkable."* This latter view was typical of woodlot loggers' impressions of the emphasis on safety derived from the Act. The previous two quotes typified opinions of well informed company loggers.

Company rules and policies

Companies demanded safety and training strategies from their contract crews. *"I'm meant to check up on the guys - with CHH they reckon I should inspect the felling face three times a day... See if they're [the workers] starting to develop any [bad] habits. If there's any, do something about it, correct it...make guys aware."* and *"We go through the guys' chainsaws, make sure all their mounts and handles and cutters and everything is all intact; all the boots, all the safety clothing, the chap, then the machines, the oil leaks, the brakes, the safety belts, fire extinguishers; you gotta have everything - so that's every three months*

you do those ... that's an ongoing thing, and they just come round and want to have a look in your book, and [you] gotta keep all your records up to date."

Company contractors saw such procedures as one way the companies had of ridding the industry of bad contractors. *"Guys take risks to avoid the regulations... [but] the FOA are bringing out a thing where you'll see in the docket book a registration number, and if your crews not registered, they won't let you send your logs... all the big mills won't touch logs if the guys aren't up to their training, or registered with the LFITB."* Many companies have their own set of rules relating to safety and operation processes, called critical rules. Failure to comply with these could result in contract termination. This encouraged compliance, although workers said sometimes rules were ignored at times when there was no supervision. *"I don't know why the company don't sack him out of the bush... like we didn't go on the skid site and do the hazard ID ... I'm fucked if I know how they [the supervisors] never got into [realising] what's going on. You'd think they'd be able to see that we weren't sticking to the rules but they never said nothing. The boss could pull the wool with slippery talk. ... see they got on pretty good with him because he's got the gift of the gab, this fulla."* The crew usually acquiesced because failure to do so would jeopardise their jobs. Thus there were variations in how seriously crews took the critical rules but their imposition created a greater awareness of regulations and safety issues, at least in the company crews.

Woodlot crews had no imposed rules. *"We actually went up to Te Kai [to work for a company].. and we'd do these audits, and it wasn't until then that Stan [the contractor] thought 'Oh yeah, we should be doing this, and we should be doing that' - normally in his situation I wouldn't know who would check on him ... no forest manager or whatever - and so I don't know who would keep an eye on him... to make sure he doesn't get sloppy. See, when he went back to Omarapiti, he went back to his old ways."* This logger recognised that consequences for poor safety systems did not exist in woodlot crews. Isolation, lack of supervision, lack of consequences, could mean a decline in safe behaviours, particularly with the return to a difficult physical environment which was not conducive to safe practices.

Knowledge of the regulations.

Many woodlot loggers had not seen a bush code, or FIRS booklet, and had little or no contact with the bush inspector. The geography and remoteness of their operations, and the reluctance

of the contractor to inform authorities of their whereabouts were partly responsible for this. One fringe contractor, who had recently driven himself to hospital after an accident claimed *"I don't want nothing to do with those things. I am happy to look after myself and don't need some suit telling me how to run my life and my business. If I hurt myself, that's my look out. I don't want ACC or anything. But I don't want people interfering in how I do things. Okay, I broke a few ribs. Fine, so I drove to the doctor's, and they patched me up, and now I'm back on the job, and I'll go on doing things just how I always have. I've seen the outside of a bush code, but I never opened one up to see what's inside. Hahaha."*

Knowledge of the HSE varied from region to region. In the Central Plateau, company supervisors acted as quasi-bush inspectors in policing safety requirements. Woodlot crews generally had contact with companies and thus some exposure to the regulations. The pervading influence of big company plantation logging ensured most loggers were familiar with the bush code. Company crews in the Far North and Manawatu/Southern Hawkes Bay usually had some knowledge of the regulations and bush code. But in the woodlot crews, especially those on the fringes, there were some confused understandings. *"This safety act thing - it's getting crazy. They won't let you do anything - I mean the council will come in and say you can't employ this guy without all the safety gear or whether you can fell a piece of teatree on your own property... you can't cut any native unless you get a special permit even on your own place... Not even for your own use ... Just rules and regulations really, you can't tell, it's wasting your time, like we say up here, there'll be some idiot sitting in Wellington making all these rules and regulations, and it gets somebody else a job."* Loggers often mixed dislike of local bodies, environmentalists, safety regulations, and training imperatives in a discussion. Much of their information was not first hand. In many ways it all meant the same to them: a hindrance to making a living.

Many workers did not understand the implications or the levels of responsibility set out in the Act. In fringe crews, some contractors deliberately avoided passing on the information. *"No, I haven't used the bush code. The boss said it was his and told us not to look at it."* They possibly saw worker knowledge as a threat which could expose their unsafe practices.

Changing perceptions of what the Act means

Towards the end of 1996 and into 1997, positive attitudes towards the HSE decreased markedly. Loggers previously convinced that there would be an increase in professionalism in

the bush, security of employment, a drop in accident rates and a subsequent drop in ACC levies, were much less enthusiastic, because results did not match expectations. *"You haven't got any more security of employment. See, you work away at getting it all right, following their guidelines and doing your safety stuff. You go to put in your tender, and I bet a thousand bucks they couldn't give a stuff about your regulations as long as the price is low. And the supervisor says 'Ohh, yeah, keep those things up to date and we'll see you right.' Bullshit."* Some contractors though, while cynical, continued to see merit in improved levels of safety and training. It was for their crew's benefit, and they still felt that companies would give preference to crews with a good record.

In the later interviews, loggers said that sticking to the bare minimum training was more prevalent. *"I wanna learn how to drive the skidder [but] it pretty much isn't gonna happen, because I'm a cross cutter, and he has no reason to teach me. And that really disappoints me, because I'd really like to get my national certificate; I'm still ambitious...He [promotes training] but only up to the stage that is required of him, but he's not interested in pushing you beyond that stage."* This change in emphasis, and the lack of jobs they felt were implicitly promised for qualified crews, led to cynicism from both workers and contractors.

In the final set of interviews, none of the loggers had a positive view of company attitudes to safety and training. *"Someone's doing something wrong - every time they come up from the company I say, 'When are we gonna get these modules, cause nothing's being done about it' ...[The company] is not conforming in safety unless they really have to, and they don't give a stuff - long as they make a profit."* Loggers said there were cut-backs in supervision, laying off of trainers, and evidence that companies were turning a blind eye to shortcuts. There was a general perception that the companies were determined to increase production, if necessary at the expense of safety.

Covering ones back

The companies responded to the HSE by meeting the minimum requirements of the Act to avoid responsibility for safety. Some company officials denied this, whereas others were more candid: *"Like, if we can't show that they [the contractors] have identified hazards, hazard IDs, has he done one, did it include loading hazards, did we check it? If we've done all that,*

we're lily white. Then we gotta make sure that the accident reporting procedures are being maintained and follow up etc., etc.; we gotta do a lot of arse covering ... we've had one death down here... and we ended up in court ... it gave us a shake-up ... you gotta be prepared." The emphasis was on shedding blame rather than safety. The general perception amongst loggers was that this was the effect of the Act.

Loggers felt that the companies tried to cover themselves. *"They are covering their own arses... the companies say you gotta pay for the training yourself, and yet they were the ones who said we gotta all be training by January 1996."* There was further resentment because the companies had instigated the thrust for training and now, in the eyes of the loggers, were abrogating their responsibilities. *"They said we're not gonna hire anybody that's not got a module, then the ball starts rolling, and they say 'All you guys gotta pay for your own modules before you can get a job here.'... I think it was a deliberate exercise by the companies - it was their plan - they said a couple of years ago that all the crews that didn't have everyone with their basic modules by Jan 1996 would be stood down. They didn't do it in the end, even though they sent us a letter telling us they would do it - but they couldn't in the end, because not everyone got [modules], and they needed the logs...."* This indicated to loggers that companies placed safety and training behind production. It implied that compliance, not safety, was the focus. Indeed, as contractors became aware of the implications of the Act, many attempted to minimise their own liability. *"We made a safety policy thing, and the guys have to read it and sign to say they have read it... so we have a record to say they've read it and that covers us, and this is to do with the big companies... what I'm trying to say to them is 'Look you guys, if you have an accident and it's proved that it was your fault, because you've signed the safety codes, and... we've run you through your bloody modules... OSH people can... sue you for doing something silly.'"*

Points of discussion

The high log prices which dominated the market in 1992, 1993 and 1994 accompanied the introduction of the HSE. Profits from forestry were high, and there was considerable demand for logging crews. The high demand for logs, and the good company profit margins meant there was leeway to accommodate the new requirements of training and safety. By the end of 1996, there had been a marked decline in log prices. Through 1997 and 1998, prices continued to fall and the log market became very depressed. Profits fell, and many crews went bankrupt (Jayne, 1998).

Initially, the 1996 FOA training policy suggested that companies had a concern for the welfare of the workforce and a strong intention to train their crews to a high standard. The policies and rules they introduced appeared to confirm this. Most company loggers in the early interviews felt increased professionalism in the industry would build skills and reduce the danger inherent in the job. Woodlot loggers were not affected to the same extent and had less positive attitudes to regulations.

The companies had a better understanding of the HSE than their employees, which meant they could ensure their minimum responsibilities were covered and any blame was focused on individual contractors or workers. Nelson et al, (1997) found that in the construction industry many contractors were only vaguely aware of regulations. Mayhew & Gibson (1996) found that health and safety regulations tend to be oriented towards large organisations, and small organisations (such as contract crews) feel alienated from the process and find it difficult to comply. Lamm (1997) maintained that contractors find it hard to keep abreast with changes and rely on accountants or other advisors to assist in minimum compliance. Many contractors struggled with the regulations, and woodlot loggers had the least understanding of the HSE. Ignorance, misunderstanding and antagonism about the regulations and the bush code have implications for safety.

Loggers' claims that the companies did not care about safety were often triggered by other dissatisfactions. Levies did not fall because accident rates remained at high levels (Bell, 1998). Thus, experience rating of ACC levies did not appear to have worked, a finding which confirms Brody et al., (1990) assertion that there is only a weak link between financial reward/punishment through insurance and accident levels. The initial enthusiasm from company loggers for the HSE turned to cynicism. Woodlot contractors were also resentful, because they believed their marginal operations were made more marginal by the demands of the Act. They had to pay for training, improving the safety standards of their machinery, and providing safety equipment for their workers.

As economic conditions deteriorated, fringe woodlot contractors grew more hostile towards the regulations and 'the system'. Company contractors shifted their resentment from fringe contractors to the companies, as they began to realise they had not benefited by complying. Compliance costs, including training, increased safety equipment, and development or purchase of safety related documentation, had reduced their profits. Despite complying, their

tender prices had, in most instances, fallen. Zeitlin (1994) found in a field trial with loggers that compliance costs determined the degree to which safety rules were ignored. When large numbers of crews were laid off by the companies, contractors accused the companies of reneging on promises. They recognised none of the benefits, but rather saw extra costs associated with compliance.

Contractors who felt secure in their contracts remained more amenable to taking a proactive approach to safety. But as economic conditions worsened and production pressure increased, it became difficult for even the better contractors to support the Act. By finding fault with the Act and the companies, they felt less guilty about breaking regulations. Although the push for greater production by the companies seemed to be in conflict with their demands for safety, company crews still had a better accident record than woodlot crews.

The bush inspector

The OSH inspector's role was to ensure compliance with the Act through education and enforcement. The bush inspectors had their own perception of how they should enforce the Act, as did the contractors, the workers, and the companies. This axial code derives from the following open codes:

- *The bush inspector's own perceptions*
- *Contractors' views of the bush inspector*
- *Workers' views of the bush inspector*
- *Colluding against the bush inspector*

The bush inspector's own perceptions

Bush inspectors said it was difficult to cajole loggers into sticking to the bush code. The inspectors hesitated to close crews down temporarily, because that would only make them more marginal and thus more likely to work dangerously. *"It's such a fine line between driving them broke and forcing them to look after their own safety... some are good guys...and I haven't the heart to tell them that if they don't spend fifteen thousand dollars building cages on their machines, then I'll close them down. I mean, shit, I've been a logger myself. I know how hard it is."* Bush inspectors empathised with loggers. Most were of the 'old school', coming through before the FIRS modules. They found it hard to be like a policeman, when going out to crews.

One bush inspector, who tried to adopt a more authoritative stance, reported that he hated the antipathy generated by his arrival and attempts to enforce procedures such as using signs for danger, wearing chaps, or seat belts. He had been threatened on some occasions by loggers who were unwilling to comply. He said that if he was too lenient the loggers took advantage of him. He felt there should be two separate jobs, one for prosecution and one for advising.

Contractors' views of the bush inspector

Most crews rarely saw the bush inspector more than twice a year, unless there had been an accident. In company forests, staff monitored safety to some extent, and bush inspectors had less need to act as 'policemen'. They were not seen as a threat, except when there was an accident. More orthodox woodlot contractors saw the bush inspector in a similar light. They appreciated that he had the welfare of the loggers at heart. *"They probably do good jobs, and I think it's good having them. It all depends on the personality of the guy, like, there was one bloke, and he was a damn good guy; he wasn't interested in prosecuting. He was into teaching safety."* Contractors who ran their crews smoothly and profitably generally had no problems with OSH and the regulations. However, some contractors who ostensibly advocated education over prosecution were not averse to expecting their workers to take risks.

Only a few contractors felt antagonism to the inspectorate. Anger towards the bush inspector was mixed with other resentments. *"I think a bush inspector is an arsehole of a thing... like, before, you were innocent until someone proved you guilty but now you're bloody guilty till you can prove yourself innocent... Like, see that system has basically been changed, like, the same with the tax structure. Like, GST, like, you gotta prove your GST, and if you can't prove it every little cent, then you're guilty of tax evasion, and it's the same as this thing here. Unless you've got all these records and training and safety; if you haven't got all that, then you're guilty."* The mixing of tax with safety regulations reflected a more general sense of frustration with how the crew was operating.

When there was conflict in the relationship between contractor and inspector, it was difficult for an inspector to enter the skid site comfortably. Inspectors usually understood that contractors did not want 'silly little things' pointed out, and they ignored or light-heartedly mentioned problematic issues. *"No, when you get a good bush inspector like Bill, you can get away with a bit like ... Bill knew I'd been doing all this tree felling and everything, and*

each time he turned up I was on the tractor, so I didn't need chaps. And I was felling up north and I thought 'If I go down by the roadside, I'm gonna need some chaps,' so... we were sitting by the roadside, and who should go past but Bill, so he turns round and comes back, and of course here I am sitting here with these chaps on, and they're brand new chaps, and he never said anything, but I would say he would have grinned to himself, hahahaha."

By sharing the humour of the situation, the bush inspector showed he was part of the culture which helped with rapport. And yet this limited his ability to enforce the regulations. It seemed many contractors took advantage of this relationship.

In the fringe woodlot crews, contractors were more apprehensive of the inspector. "If he hears 'Eric' is gonna come, he'll bring everything[safety equipment] on to the site, so he gets a shock when he sees 'Eric' coming in...He's fined Marius once...No seat belt on, Marius just called him an arsehole, so 'Eric' said 'I'll see you in court'...He said, 'You're just a fuckin' arsehole 'Eric', and Eric said, 'Ohh, you can't say that. See you in court.'"

Some contractors deliberately avoided the bush inspector, thus avoiding the need to comply with the regulations. *"Well, the bush inspector has a hard job anyway, cause, like, in my case they couldn't find where I am to catch me anyway, cause we're not stuck in one block. It's hard enough to find a guy in a block anyway... the last thing I want is some yobbo coming up to my site to tell me we have to have our safety belts on. I mean you've seen how impractical that is...so what I do is, I stay underground, and I am probably breaking the law."*

Workers' view of bush inspectors

Workers often felt the bush inspector should be more active, forcing contractors to reduce production pressure where it threatened safety. *"One windy day [the bush inspector] come up but he wouldn't come into the bush but we were still working... He should have told us to stop. They need more bush inspectors, but the trouble is they're [his bosses] too pally pally with this one...See, that windy day they should straight away shut it down [stop working]. See, we were there working, fixing the machines, and the wind got that incredible that you couldn't even see. The wind and rain, and no trees hit us, but one that came down just about hit a machine. Blew down, and we had to hide under a machine when that gust hit. And we kept working."* This worker believed the reason the bush inspector did not intervene was his relationship with the contractors.

Where production pressure was increasing, especially when the boss was disliked, workers said there needed to be more policing. *"I reckon here in the north, to get them up to scratch, like, these contractors and everybody up to scratch... you gotta have the men [bush inspectors] here to get them [the contractors] in line... to let them know that you mean business... I always maintain that they shouldn't warn them before they come."* There was cynicism that most bush inspectors announced their arrival beforehand. The operation was quickly brought up to scratch for his visit but lapsed again once he had gone. This emphasises the limited effect the bush inspector had on enforcing compliance in remote environments.

Colluding against the bush inspector

Ironically, despite most loggers feeling there was a need for a greater number of inspectors, they generally colluded with the contractor to avoid prosecution. One experienced worker related how he helped the contractor avoid trouble, even though, during the interview, he repeatedly maintained that the contractor had no concern for crew safety, and the bush inspector should do something about it. *"He told me [the bush inspector] was coming. I said '... your best bet is to have your books up to scratch and agree with him. Don't disagree with him cause he's right... Get everything up to scratch and just go along with it... You should get all the gear looking good and have all the safety stuff for all the fillas on the crew.' ... And the thing that annoyed me when [the bush inspector] came was when he looked at the book instead of at the men, like, he could have at least come round and looked at the men but he looked at the book... saw everything was in place: 'That's good,' and away he went."* The worker did not acknowledge that he had conspired against the bush inspector gaining an accurate picture of the crew's operations.

Points of discussion

There are only ten bush inspectors in New Zealand. Nelson et al., (1997) found that increased inspectorate staff led to a near halving of accidents, illustrating the need for sufficient numbers of enforcement officers. The four bush inspectors I talked to all wished they could do more educating but found that their time was taken up investigating accidents. One inspector anticipated that the investigations for three recent deaths would take up about four months of his time. He estimated he had two hundred crews in his area and only vaguely knew where most were operating. In a study of Queensland builders, Mayhew and Ferris (1998) found that despite the introduction of new and more stringent regulations, when contractors worked in geographical isolation with little contact with inspectors, compliance

worsened. This was especially when production pressure increased. Nelson et al. found compliance inspections were usually so rare amongst small organisations that risks were frequently taken, particularly when compliance costs were greater than prosecution costs. If prosecution is infrequent and the focus is on specific accidents rather than general negligence, regulations have little impact on safety activities. This is particularly so when actual fines are well below the possible maximum (C. McLean, 1998).

When the bush inspector visited a crew, he entered the contractor's domain. The boss was the leader, and it was protocol for the inspector to defer to him to avoid conflict. Workers suggested that this was sometimes at the expense of safety, because, in being friendly with the contractors, the inspector sometimes ignored breaches of the regulations. Parsons (1989) found that when health and safety strategies were voluntary, they failed. He suggested that government agencies needed to enforce compliance.

It seemed to be part of bush culture that crews closed ranks against outside interference. Ludwig and Geller (1991) noted that the desire for group approval influenced the degree to which compliance was observed. Until there was extreme danger most loggers would not complain to OSH. Collusion might occur because of the bonds within the crew, because loggers were used to battling against authority, or simply because they feared they would lose their jobs. Generally workers felt powerless to do anything else and feared getting in trouble with OSH. This was partly linked to the belief that fault lay with the person who committed the 'unsafe' act. As Slappendel (1995a) notes, as recently as 1990, the Department of Labour reports used headings such as 'unsafe conditions' and 'unsafe acts'. Clearly, although the HSE was meant to address accidents holistically, both contractors and employees continued to attribute cause to the immediate event and the person/s directly involved. This helped to perpetuate the 'blame the victim' syndrome, and took the focus away from employer responsibility.

OSH had not successfully changed to a more holistic approach to safety. The Act maintained it was the responsibility of the entire organisational chain to ensure safe systems and behaviours. The 'cause' of accidents from a systems or sociological point of view is located in the total milieu of the forest industry. While the Act might not prescribe assessing the wider social dynamics in the instance of each accident, it did imply that there was a need to do so. The contractor and crew were influenced by the industry and the market, by the culture in

which they lived and the environment in which they worked. To attempt to take into account all these factors and include it in a single report was probably beyond the scope of a bush inspector. They had limited resources, time, and training to deal with accidents at an holistic level. It was simpler to focus on easily identifiable factors, such as a breakage, or an unsafe act, or even luck. A worker committing an 'unsafe' act was likely to be more defenceless than a contractor or company if a prosecution was taken to court.

Systems for implementing safety regulations in the crew

Contractors may have their own systems to ensure safety. In company crews these are more formalised and demanded by the company, although there may be only superficial compliance with those demands. In woodlot crews, any formal, documented systems, are far less likely.

- *Supervisor checks*
- *Hazard IDs*
- *Accident reporting*
- *Flouting regulations*

Supervisor checks

Companies employed personnel who supervised up to twenty crews. Supervisors' jobs sometimes involved safety checks. *"Our supervisor comes round every month ... he checks that you are up to date and checks your training records and that sort of thing. If anything goes wrong, we got everything down on paper ..., got everything up to scratch and ... they're [the company] covering their side and we're covered our side, in case anything goes wrong."* Contractors developed a reasonable relationship with the supervisor in most cases, particularly when their operation was running well.

One aspect of the restructuring of the industry was the introduction of younger supervisors, some of whom had never worked in the forest in any physical capacity. *"Like, they had similar supervisors from the previous companies, but they slowly cleaned them out... and they started getting the younger whiz kids in, with their degrees and things, without the practical understanding."* The supervisor's role had changed in the bigger companies, from advising and guiding to something nearer to an auditor.

Hazard IDs and safety checks

Many contractors developed extensive checklists which took note of the physical hazards in each block they were going to log, and which they adapted to suit each new block. *"Everyone on the crew is given a copy and they have to be aware of the hazards in the area. It's ongoing, eh? ...I spose when they phase out the supervisors I spose the boss will have to do that sort of thing. But whether he will do it I don't know - like he would have to do it, but I don't know who will check to make sure it's all up to scratch... how can you trust some of those bosses that they will do the check. They might just tick it all, without doing anything."*

As each hazard ID was done the crew was supposed to participate, and most contractors were adamant that they did. In reality, many contractors did it themselves, and told the workers if there was anything particularly dangerous.

In woodlot crews, safety checks were often only a token gesture. *"The hazards, that's a joke. He never does that. Or maybe once in a blue moon. And then it's just tick, tick, tick. And when Bill [the bush inspector] comes out, I don't think he looks to see if it's done. Murray really just leaves it up to us to look after ourselves, and he doesn't know what he's doing anyway, so the boys would do the opposite. Like, on Roger's course we were told this is how it is - hazard book, safety meetings, gear checks, all that stuff, but Murray never does that."* Conversely, workers in the crews with the a good safety culture said there were regular meetings and checks for safety and hazard identification.

Safety checks were supposed to entail a thorough weekly check of all equipment and ongoing monitoring of techniques and systems to ensure safety was maintained. In big company crews, the process was facilitated by the company. *"The CHH guys, they have forms to fill out. ...Each contractor has his own policy and ...their own sheets for auditing, and also they have hazard ID sheets that they are meant to carry out in conjunction with the guys... but a lot of other contractors just tell the guys. If guys can identify these things themselves, then it makes them feel more part of the system ... it changes their attitudes and makes them want to do more than they would otherwise."* It remained up to the contractor to ensure that the level of communication and sense of involvement were felt by the workers.

Accident reporting

Accident records had a long term effect on how much the contractor paid for accident insurance. Consequently, there was a temptation to cover up accidents. A contractor talking

about an incident in another crew said, *"The loader was loading the truck.. the whole thing slid and he got hurt... he just got a fracture, but he was all right. But I was just mentioning it to the bush inspector, I said, 'Did you get the accident report,' And he said, 'Ohh, no, I never got that,' ... See, the boss was gonna just pay the guy and keep it quiet. It's the levies, ACC, they hammer you, and these fillas are struggling to pay their bills as it is."* Contractors could encourage workers to say the accident happened at home. They could threaten workers with dismissal if they reported it. A trainer from the Far North said this was increasingly common, particularly with marginal crews.

Some contractors said that if they did report accidents, the inspector might unfairly assess the incident. *"As a guy went to walk past another guy, he bounced a saw up the back of his hand... wasn't too bad, no stitches, but it was an accident, so it was reported and he [the bush inspector] was pretty officious with that. Took him two months to decide whether to prosecute the guy who got hit. Like it wasn't the young filla's fault, and we're covered because of the policy. He couldn't pin anything on me and Jay, the young filla who was using the saw. He couldn't pin anything on him, because Tony walked up behind him, so he's pinning it on Tony, and hell, Tony's only there to give us a hand for a week."* His perception was that the bush inspector wanted to 'pin' the blame on someone, even if the accident was not anyone's fault. Thus, some loggers felt vulnerable, rather than protected by the regulations. Carter and Menckel (1984) note that workers may be scared of prosecution and cover up accidents because of the repercussions.

In contrast, some contractors were fastidious in ensuring all accidents were reported. *"A lot of people are scared to write something in the accident register ... but we say to the men, 'If you cut yourself, get it in the book, we don't care.' ... see, we've had two letters from them that just come out of the blue - so and so is on ACC. We had no idea. We say to the men "Tell us, we don't wanna hear when it comes outta the blue. Put it in the book, then we know."* Workers from this crew confirmed that they were encouraged to write everything in the book. They had comprehensive safety policies, regular inspections, and their training was safety oriented and well documented.

Flouting regulations

Some bushmen found it a challenge to flout the regulations, despite an apparent concern for a safe workplace. *"See, the truckies will radio through to you they seen [the bush inspector]*

on the road heading in our direction, so we all gonna get our best behaviour together. Seat belts on and singlets. It's just to please Ben really. Use the mitts and that, but only when he's there. I mean we all have a bit of a laugh about it, hahahaha. Rest of the time we don't give a stuff... you do things that are common sense. Not because it's in the book." The macho culture of the bush influenced the taking of such a stance. In contrast, some contractors were active in ensuring their crew's safety. *"You get guys who are just stupid. They think it's a big joke to take risks, they think they're big men, but in our crew we don't think like that. I spose I was a bit like that before I came to Bert's crew, but he soon put me straight. Like, before I would take crazy risks with dropping trees ... Definitely not with Bert; he'd bawl us out, or throw us out."*

Loggers occasionally said they got bored having to do everything by the book. Going against regulations for the sake of it illustrated a commonly held belief. This was that accidents would not happen to them, the forest was not really dangerous, and even if it was, it was their prerogative to take risks. *"Well, it didn't seem like near misses, because we were full of adrenaline, and we enjoyed the excitement; like, I loved it ... You never thought that maybe the rules of safety were to stop you getting smacked in the head or something. And it was up to you whether you wanted to be safe and bored or going hell for leather."* Workers developed their own sense of safety based on experience. If they had not had a bad accident, they were likely to discount danger.

Loggers thought some regulations were ridiculous, such as the proposal that the contractor should provide *portaloo*s. There were also rules such as having to get an observer if someone was going to drive more than one tree. While it made sense to those who had witnessed accidents where loggers have been crushed by falling trees, to most loggers it was a waste of time. *"...sometimes those rules that are enforced are stupid rules, anyway, so it's better to break that rule and take ten minutes to do it than do it by the book and take an hour."* These examples were often used to justify ignoring all regulations.

Points of discussion

Cohen (1977) maintains that frequent contact between supervisors and workers is a characteristic of companies with good safety records. Recently supervisor numbers have been reduced in some logging companies. There was concern that, with the phasing out of supervision, the stringency of hazard identification procedures would diminish. Blewett and

Shaw (1996) noted the tendency for employers to implement safety procedures so that they looked good in the eyes of authorities, rather than to make any open improvements, and this is supported in the present findings.

Most administration staff in the Forest Service had, at some time in their careers, done physical work in the forest. New administrative staff in the companies increasingly came from a non-forestry background. Because they had little or no experience of logging, they found it hard to earn the loggers' respect. This contributed to a widening of the gap between company staff and the loggers.

A visiting bush inspector usually looked in the report book, where all accidents should be recorded. Many workers did not report accidents to the contractor. Fielder (1997a) suggests that non-reporting may be because of fear and distrust, and there was evidence of this in loggers' accounts. Further, some loggers said that even when they told the boss, many accidents were not reported to the next level. This supports what researchers in OSH suspect: that only about 20% of serious harm accidents are reported (L. Bell, 23rd March, 1999, personal communication). For example, logging accident claims to ACC in the year ended June 1998 were 926, whereas reported serious accidents to OSH were only 96 for the same period. OSH estimates at least half the ACC accidents should have been reported to them (Bell, 1998).

Contractors may fear prosecution as well (Mayhew & Gibson, 1996). Contractors struggling with the company systems were more inclined to cover up accidents. Because safety records were a company criteria for tenders, some accidents, especially minor ones, were covered up. However, loggers said the biggest cover-ups were in woodlots where there were no company influences. This suggests that company policies were not the only critical issue. Sometimes a contractor would selectively denigrate the regulations, fostering antagonism towards regulated safety. This maintained the existing propensity of loggers to feel besieged by bureaucrats, and it justified the flouting of all regulations. In jobs like logging, many bosses encourage a culture which denigrates excessive safety measures. As Zeitlin (1994) notes, self-image and social acceptability are important components in the decision whether not to comply with regulations.

Influences which shape perceptions of regulations

There were dynamic influences within the bush which changed perceptions of the regulations and associated issues:

- *Regulations as anathema to bushmen*
- *Individual responsibility, fatalism*
- *Production pressure*
- *The realities of prosecution and workers' rights*

Regulations as anathema to bushmen.

Input into the bush code came largely from FITEC, OSH, and FOA. Any loggers they seconded to assist them in developing the code came from company crews. Woodlot loggers felt alienated from the process (Rowse, 1997), and many said they did not want to be involved. They believed that their own judgement, experience, and 'common sense' were better. Yet, often, loggers' beliefs were based on single incidents. *"This blinkin tree started to fall the wrong way, and I wanted to run for it, and I couldn't leave the saw because I couldn't get my hand out of the flamin glove [mitt], so I had to take the saw with me, and I just missed getting out of the way by a thread, and that happened a couple of times. I didn't bother with them anymore."* There was no admission here that the logger may have been using poor felling techniques, or that in other circumstances the mitt may have prevented an accident. Loggers, in choosing to be bushmen, expected some risk, and were unconcerned, providing it did not become excessively dangerous.

Loggers believed that safety comes naturally to most bushmen with experience. They were willing to use gear only if they believed it improved their safety. *"I just do the best I can, and fuck the rest, including the regulations. I mean, I wear these chaps, cause I'm not stupid, I wear safety gear, cause I'm not stupid, I mean, I ripped the sole off my boots a couple of days ago, and with a long weekend I haven't got a pair of boots to replace them with; I haven't been into town. So, boots, non-regulation. Fuck regulation."* Thus employees were aware that regulations were partly for their protection, but did like to discriminate.

Individual responsibility/fatalism

The traditional culture of the bush perpetuated the notions of skill, experience and luck in relation to safety. It fitted their image of the hardy, independent bushman who pitted his skill against the environment. Yet their actual experience involved realities such as the mud, cold,

harsh conditions, an angry boss, declining wages, and increased pressure to produce. It was not unusual to find the same logger expressing opposing beliefs with the same conviction. Thus, many loggers did not feel they were in danger, although they knew it was a dangerous occupation. *"I think it just comes down to the individual guy... This guy... he'd been in the bush for years, put a scarf and a back cut in a tree. Wouldn't go over. Put another one into that tree and that wouldn't go over, so he went to a tree in front and felled it, and in the mean time this tree came over [on him]. I mean it's pathetic, when you think about it."* Ironically, loggers said experience was the best way to gain safety skills, yet this experienced logger killed himself.

Many bushmen were fatalistic and believed there would always be accidents. *"You never know what the environment is gonna do. You can never predict it. Like, you might have someone who knows everything, what to do, what to wear, how to do it, but there can always be an accident. They may not have it for fifteen, twenty years but there will always be one, or two or three."* There was acceptance that there would always be accidents, but loggers sometimes believed that by being skilful they could control their own level of luck.

Production pressure

Often loggers traded safety for effort, and took shortcuts because in the immediate sense it paid to. Most claimed that strict adherence to the regulations slowed down production. *"Like, all these rules and regulations they're just great for safety, but it's just too hard to make money with them, from compared to when I started to now, your percentage of net profit has probably dropped by 50%. I guarantee it, my accountant has told me that himself, and that's at least partly because of the OSH."* Many loggers broke company rules, claiming an inability to meet the required production quota otherwise. While company demands meant they had to try to comply with regulations, they were also aware of the need for production, and so they stretched the rules. *"The contractors out there are flogging the guys, and every company has a safety policy - they tell you not to break the rules, but if the contractor isn't out there breaking the rules and pushing the guys just that little bit extra to do the shortcuts, people wouldn't make any money - they'd go broke."*

When production pressure increased, regulations demanding 'one-off' costs such as safety cabs, safety clothing and so on were still seen as inevitable. The systems and methods defined by the regulations as safe were more likely to be ignored or stretched. This included things like the use of incorrect scarfs, and driving trees.

Realities of prosecution and workers' rights

In the event of a serious accident, those who had experienced prosecution by OSH sometimes felt unfairly treated. A logger who was involved in an accident which killed a man said: *"I was driving the loader and ... the signs were up but a guy came along in a ute, and he didn't see me and drove straight into me ... and I got blamed ... got a two thousand dollar fine, in fact. The company didn't want to know about it - suddenly, it was nothing to do with them - I was in the wrong, because a sign had come down somehow, and, anyway, the company didn't support me. I got taken to court, and they never even suggested prosecuting the company... the company virtually washed their hands of this particular incident. ... they didn't put any notices in the paper. They didn't even put a notice in saying this operation will be carried out on such and such day. It was a private forestry road with the right to public access, and the guy wasn't driving excessively or anything ... At the time it was a very harrowing experience. To see a guy lying dead on the side of the road, but at the time it never occurred to me that I might get blamed for it... the bush inspector came round, and I told him everything, which I shouldn't have done, and the next thing I know he's going to file a charge... No thought that the company might have anything to do with it. Not even the contractor. The boss thought it wasn't his fault. I spose, like, I can see it was my fault in one sense but all I'm doing is working for the company, if you ask me, and if there are trees to get out, then I'll get them out. Like, that was the best and easiest way to get the trees and I was loading... then this guy comes hooning along the road and hits me. I couldn't have done anything about it... I still can't see why all the responsibility got loaded on me, and they never even questioned anyone else.... the bush inspector wanted to get me out the bush...but it made me start to realise how the company would remove themselves from people doing the job in the bush."*

This illustrated loggers' vulnerability regarding regulations. As individuals in small crews, they were reliant on the boss for almost everything relating to work. They were unskilled apart from their forestry expertise, and were at the mercy of the contractor and ultimately the companies if they worked in a company crew. During the 1960s and 1970s the union was strong in some of the big forests. After considerable confrontation, the companies managed to rid the forests of almost all union presence. If a boss put workers in a dangerous situation, they had no voice: *"We got no unions - ...I don't know much about unions, but I heard they're pretty good, cause it helps the worker secure you your job. The boss might say, 'Ohh, go up there,' and you say, 'No, it's too dangerous,' and he goes, 'Ohh, if you don't go*

up there, you're sacked,' and you go, 'Well, I'll go and see the union, and then they'll come round and say, 'Ohh, this fulla is right.' It gives you an extra leg to stand on. [But] now the boss has got no worries, so he can send you down the road.'

Those aware that a bush inspector could close a crew down and prosecute the contractor for unsafe practices were not inclined to contact him. It would jeopardise their jobs and create trouble with their boss: *"See, in these bad situations that's where the union would come into its own, wouldn't it? They'd have a written agreement where it would say we would get three weeks a year holiday or five days sick pay or whatever, or such-and-such is too dangerous, and we ourselves would know where we stood. The only voice we have is with our employer. See, some of the guys know that there's another guy there for the job so if you push for something, they just say 'Okay, off you go' - that's happening, and that's what they say actually. 'I've got another fulla on the list,' so you gotta be diplomatic, you gotta be careful, so you haven't got as many rights as you should have."*

Points of discussion

There was a belief that the bush was only as dangerous as an individual made it, regardless of the operation. This concurred with both Nelkin and Brown's (1984) and Walter and Haines' (1988) finding that workers stressed individual responsibility for safety. Workers would like to see more bush inspectors to police the code and believed dangerous contractors should be prosecuted, yet they thought safety was an individual's responsibility. Such beliefs tended to support Dedobbeleer and Beland's (1991) finding that, while workers often also apportion some of the responsibility to management, there is also a degree of acceptance of individual responsibility for safety.

By pushing the workers hard, and expecting them to work in extreme conditions, contractors disregarded the intention of the Act, which states that employers shall take all practical steps to provide and maintain a safe working environment. According to workers, it was often the speed with which things were done that made them unsafe. Speed could lead to corner cutting, inaccuracy and fatigue. Neither the code nor the Act specified acceptable levels of production relative to workers' ability to sustain that pace of work. There were too many different environments in which loggers worked to specify what was an acceptable speed. In adverse weather conditions, the need to work more cautiously was important, but, ironically,

that was when the contractors were likely to demand the loggers work harder, to make up for conditions slowing output.

Danger caused by conditions was acknowledged, and yet at the same time seen as an integral part of the job. When working for a marginal crew, loggers recognised that work must go on if the crew was to survive. In the bigger forests, when conditions got too dangerous, contractors would consider closing the skid site. Because the Act and the code were unable to define unsafe conditions, and there were insufficient personnel in OSH to police all the crews, loggers reported that some contractors took a broad interpretation of what was dangerous. Rather than create a fuss about violations, in the last resort loggers left the crew. Even unions have trouble influencing employers regarding health and safety, according to Dedobbeleer, Champagne, and German (1990). Most loggers had only a vague idea of their rights, confirming Rasmussen's (1995) finding that many workers were poorly informed of their rights and less able to negotiate a fair contract.

The culture of the crew, when shaped by an unsympathetic boss with little concern for his workers' safety, did not fit the ideal of a close harmonious group of bushmen. Workers had some hope that the regulations would protect them from this situation, and possibly improve their general conditions. They recognised that they had little voice, with no union. Yet they were scared of the bush inspector, because of the continued focus on blaming the victim.

The myth persisted that the loggers of old did not need regulations to ensure their safety. The change in safety culture encouraged by some contractors was only slowly bringing new perspectives. Dedobbeleer and Beland (1987) suggest it is up to the employer to provide positive consequences and to display attitudes and behaviour demonstrating commitment to safety.

The crew and safety

Contractors were in charge of a group which had little contact with outsiders, and there was only occasionally any other person of authority present. Consequently, they played an important role in the way that regulations were interpreted and implemented.

- *Violations*
- *Building a safety climate which fosters regulation compliance*
- *Maintaining safety behaviour*

Violations

There was evidence of frequent violations, and loggers sometimes violated rules with barely a thought, for instance, by drop starting a chainsaw or not using seat belts. *"Yeah, I guess we don't make a habit of making sure we are two tree lengths away. I mean, you just go for it, drop those trees, trim and on to the next one. Someone is right up your arse, you carry on. I mean, you don't get too close but two trees lengths - nah. Closer a lot of the time."* Reason (1990) calls these 'routine' violations, because they are habitual and built into the culture of the workplace.

On the other hand there were violations which required a more conscious decision, based on a particular set of circumstances. They were sometimes demanded of the workers. *"Like, he would be onto me to go that bit faster. Never mind you're doing it the right way. He would yell at you to go here or there, and you know that's not safe. And he will say to cut the tree here, or be cutting when a skidder is under, and you can't say no."* Most contractors maintained that they would only expect a logger to break the bush code if they considered it stupid and/or dangerous. However, many workers reported instances where it was expected that some regulations would be contravened or circumstances where it was necessary to break a regulation, if work was to be completed.

In some cases, loggers became bored and deliberately violated a rule in order to get a thrill. *"It takes some of the fun out of it, yeah it does; I used to enjoy working in the bush one time, but not now - even, like all this safety conscious stuff that's going round now, like, I get bored on the skid, eh, and on the flats and that and I do stupid things, like buck the skidder up to get a buzz for the day... pick it up and stand up and walk round the skids on two wheels... it just gets that bloody boring, I gotta get a buzz."*

Building a safety climate which fosters regulation compliance

A safety climate consisted of more than regulation compliance. It included the behaviours and social relations within a crew, the systems used, and the pervading attitudes to safety in general. These will be discussed in subsequent chapters, but it is appropriate here to examine how logging contractors dealt with regulations as part of safety culture. Knowledge of the regulations and an understanding of their implications were necessary if a contractor was to comply with the Act and bush code. The fundamental principles of the Act were not well understood by many contractors, and those who did understand them might not always agree

with them. It was rare that a boss took the Act into account in fostering a particular crew climate on a day-to-day basis. But contractors would, if amenable to most of the principles of the Act, encourage behaviour, express attitudes, set examples, and comply with the bush code, because they found it compatible with their own approach to employment and logging. They complied because it seemed common sense to them, because they liked their workers and did not want to see them hurt, and perhaps because they believed it was good business to have an accident free work environment. *"Yeah, well, Phil will be happy to go along with the bush code, because that's his way you know. I mean, he knows the rules, and they suit him fine and the way he runs his crew. See, he will say to you, 'It makes sense to go home at night with all your fingers still there and no bruises and bumps'. He's not the sort of fulla who would be happy about telling your missus you're lying dead in the back of the ute. So he will say to us, 'Hey, read your bush code, and stick to the rules cause they are there for every man's welfare'. He wants that sort of crew."*

Though company systems influenced safety the contractor adapted them to suit his own local systems. Safety checks could be brief and cursory, and less care taken of the machines than the company might expect. Contractors who seemed to implement safety programmes and promote a good safety climate also seemed to be the most efficient. They saw safety as necessary to remain a company's preferred supplier but also as an integral part of an efficient operation. With increasing competition among company crews, contractors had to innovate and develop their systems to keep pace with changes. They could carry out safety training because they were efficient enough to have leeway in their operation. The culture became relatively self sustaining as long as the contractor kept a positive focus toward safety. I visited crews where there was a great deal of inter-crew reinforcement of safe behaviours. For example, in one crew younger loggers were praised for skilled, safe work. Such rules as the two tree length rule, use of hard hats, and so on were strictly enforced. In one crew, anyone who left a hang-up was berated and a discussion would ensue at smoko. Near misses meant a logger was expected to shout some beer at the pub. *"Even the older fullas, he will have a talk at smoko you know - 'Keep those skills up.' And we all kind of keep an eye on each other - even the best feller - that's Bazza - he doesn't mind if you say something when he's being a bit slack. It's just the crew that Mex runs, really. See, and he would be happy to admit if he done a mistake. He'd expect you to pull him up on it. Like he'd laugh a bit, but he'd take your point. He always says, 'Safety first and look after each other'."* This kind proactive approach was pronounced in some crews.

Workers in efficient, successful operations usually believed their boss had concern for their safety. The boss had less need to drive the workers too hard, force them to take risks and contravene the bush code. Workers usually recognised the boss's safety expectations by the way the crew systems worked, rather than any overtly expressed attitude. *"Matt's always been safety conscious, he's a good boss actually. He is sort of right up with the play, you know. If there is anything wrong, he gets in and fixes any of the machines."* Conversely, rather than saying a boss had a bad attitude to safety, workers described how the job was chaotic. They talked of disasters or near misses and attributed these to the boss's lack of concern for their welfare.

The more successful contractors, with their all encompassing systems, did talk about safety, and had safety oriented training systems that the workers participated in. They were strict in ensuring checks on safety. Such contractors were not the majority. Most contractors did just what was required of them, and there was ample opportunity to only do the minimum. There was little attempt in most crews to consciously develop a safety climate.

Maintaining safety behaviour

The recent focus on the Act and the bush code meant that gestures were made to indicate compliance. If the expectations of the code conflicted with the real crew culture, it was difficult to maintain compliance. In company crews, there was a reminder through supervisors' presence. The contractor was forced to make some gestures towards the Act. Consequences through praise, admonishment and even severe reprimands were therefore more likely.

In woodlot crews which had few systems to maintain safe behaviour, reversion to old habits could easily occur. Even a major accident might not be enough to permanently affect the behaviour of workers. Rather than follow the regulations for their own good, they might see them as restrictive to their life style and their freedom. It was up to the contractor to implement consistent and appropriate consequences to ensure safety was maintained. A comprehensive programme involving monitoring and provision of consequences was unlikely in many logging crews.

Points of discussion:

For all the intentions of the Act, the companies, and the bush inspectors, as well as some effort from industry and LFITB, there were still accidents. While many accidents were written off as resulting from unsafe acts, it is clear that there was considerable debate about whether or not the unsafe behaviour was intentional. Reason (1990) notes that while errors are ostensibly the result of cognitive processes, violations are the result of social processes, and in most instances are deliberate.

The safety culture of a crew is said to be the result of shared beliefs, expectations and perceptions of acceptable behaviour in relation to safety. In some instances, workers felt unhappy about the poor safety culture of the crew and felt it was imposed on them, mainly by the contractor. In other cases, they willingly participated in contravention of rules and regulations, because they enjoyed the challenge of risk, disagreed with the regulations, and wanted to be part of the crew culture. Although crew members contributed to the culture of the workplace, the contractor played a dominant part in shaping safety attitudes and behaviour in logging crews. Although contractors were directed by both companies and the Act to establish strategies for improving safety levels, there were often only token gestures in this regard. Safety committees were voluntary, and while the Act stated there should be safety meetings and so on, they were not policed. Parsons (1989) found that voluntary safety meetings were not very successful, and that they needed to be mandatory to be successful.

It was clear that contractors had a crucial role in fostering safety culture. When a boss was well liked and expressed genuine concern for the workers, they were more amenable to participating in a positive crew culture. Workers had to respect and admire the boss if the crew was to function well, which only happened when they were happy with what they derived from the group both materially and socially. Within such crews there was a belief that everyone's best interests were served by a good safety record, and sticking to the bush code. There was a high degree of trust and good will.

There was nothing inherent in the regulations which ensured compliance. Although the Act implicitly expected employers to take greater responsibility for compliance, if there was a need to break the regulations to produce the quota, then the Act was of little value in preventing accidents. While the regulations are designed to reduce accidents, Beaudin et al., (1997) point out that accidents occur too infrequently to provide reliable punishment for non-

compliance. They note that it is more appropriate to reinforce safe behaviour. It appeared that some contractors understood that there were associations between a safe workplace, good crew relations and high production, but most did not make these connections. They simply complied because of company demands or fear of prosecution.

General discussion

As noted in Chapter Six, many participants were attracted to logging because of the adventure and excitement. Glendon and McKenna (1995), Slovic and Fischhoff (1982), and Zuckerman (1994) have all identified groups which seek risk, possibly for both physical stimulation and peer approval. Loggers in the present study talked about the 'buzz' they got when deliberately taking risks. They told stories of risk taking and thrill seeking with enthusiasm and intensity. It formed the basis of many conversations at smoko and in the van going home after work. Stories of bravery were used to impress newcomers, and daring bushmen were revered. It seemed that part of loggers' sense of meaning was embedded in tales of their ability to overcome adversity. Some loggers deliberately took more risks than was necessary to achieve a goal. One did 'wheel stands' in the skidder. Another straddled a bulldozer to slide down a hill to smoko. Many liked to drive dozens of trees at a time. This seemed to be part of the need to inject interest into the job which Dwyer (1991) talks of. As these examples illustrate, risk was invariably linked to violation of the bush code, and in allowing it, the contractor was contravening the HSE.

Loggers suggested that safety came not so much through legislation, but through promotion and enforcement of the regulations. Gun (1993) notes that injury rates fall markedly when regulations are complied with. But Gun and Ryan (1994) also argue that legislation which places the responsibility for safety in the hands of management is unlikely to reduce accident levels. A government agent such as the bush inspector is theoretically the person who ensures compliance. Some literature indicates that inspection and enforcement do reduce accident levels and increase compliance with regulations (e.g. Nelson, et al., 1997). Lindell's (1997) findings support this but also show that often inspections are irregular and infrequent, and, where they are announced, they bring temporary changes in behaviour to avoid prosecution. This was supported by the present data. In the instance of New Zealand logging, resources available to OSH were limited. It fell to the companies and the contractors to ensure compliance. This concurs with Simard and Marchand's (1994) claim that state intervention is usually minimal and it is up to supervisors to ensure regulations are complied with. In

logging, since the contractor was working in the operation all the time and had a supervisory role, it was his presence and his intentions which decided how much emphasis was given to the regulations. Findings showed that, in these conditions, violations occurred frequently.

Safety regulations are imposed on organisations, but the real focus of any business is to make profits (James, 1987). Safety may be desirable to a boss, because he avoids medical costs, lost production, and breakages of machinery. Workers may wish to negotiate compensation for risk into their agreement. But these are monetary concerns. It is only the imposition of regulations by an authority such as the government which places a moral constraint on an organisation in regard to safety. Regulations are contrived and deliberate in an environment where organisations are responding to market forces in the interests of their own increased profits and can conflict with production (Anderson & Buchholz, 1988). As early as 1995, Duncan suggested that both ACC regulations and the HSE were increasingly anomalous in the climate of economic deregulation and the accompanying emphasis on maximisation of profit. When profit margins were reduced, the contradiction was emphasised. Petersen (1996) claims that acts like the HSE convince employers to treat accident prevention and compliance as two unconnected issues. He notes that in the 25 years since the introduction of the OSH Act in the US there has been no improvement in accident levels.

Because loggers flouted the regulations and also thought luck and individual responsibility played a large part in accidents, a moderating influence was necessary to ensure compliance with the bush code. It was apparent that company strategies such as safety meetings, hazard IDs, and accident reporting were ignored, or only used half heartedly, in many crews. As with visits from the bush inspector, efforts could be made to cover up for brief periods. Because workers were inclined to collude with the contractor, the regulations and company critical rules were sometimes rendered ineffectual. This has been reported in previous literature (e.g. Lindell, 1997).

The regulations exist regardless of whether economic circumstances make them difficult to comply with. While initially the HSE signalled a strong emphasis on training and safety, its provisions were increasingly complied with to a minimum level by many contractors. Apparently, some companies also took a less stringent approach to the regulations as time went on. Prosecutions for transgressions were rare, and, when carried out, tended to bring minimal fines. Maximum New Zealand fines are less than in Australia (Kiely, 1997) or

Canada (Fielder, 1996a). C. McLean (1998) suggests that employers weigh up the cost of compliance versus the cost of prosecution and often find the latter is less aversive. Given the rarity of inspection by bush inspectors in New Zealand, it may be tempting for logging contractors to ignore the HSE and bush code.

Some literature suggests that small businesses have difficulty in maintaining profitability and in finding the resources necessary to meet the demands of safety regulation (e.g. Hopkins & Hogan, 1998; Lamm, 1997). With the increasing pressure on logging crews and the reduced tender prices (Jayne, 1996; V. McLean, 1998), contractors suggested that it was difficult to meet all the costs associated with compliance.²

Building blocks for the theory

This chapter focused on regulations and how they affect crew mechanisms as well as processes within the industry.

Regulation in logging:

- 1) In a buoyant economy more time and resources are available for safety consideration. Conversely, with reduced profit margins, regulations conflict considerably with production.
 - 2) Critical to an organisations' continued adherence to the regulations is the contractor's ability to maintain a profitable operation and to use the safety rules to his advantage.
 - 3) The contractor may re-interpret the regulations to reduce their impact on production, with minimum compliance becoming predominant in a poor economic climate.
 - 4) The contractor can take advantage of workers' self image to reject regulations which are designed to protect those workers.
 - 5) Contractors at times demand violation of regulations.
 - 6) Workers themselves may participate willingly in regulation violation.
 - 7) As profit margins decrease, the gap widens between complying and non-complying crews.
 - 8) Adherence to regulations may not preclude good production providing the contractor can combine positive attitudes to safety with good organisation.
 - 9) Positive reinforcement of safety behaviour seems to be more effective than punishment in ensuring compliance
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Chapter Eight

Perceptions of Learning

The Health and Safety in Employment Act 1992 states that workers should be trained adequately to ensure they can work safely. The following chapter will look at both formal training and the more informal learning prevalent in many crews, and the implications these have for safety.

In logging, formal training was synonymous with Forest Industry Record of Skills (FIRS) standards-based programmes. Safety is an important part of learning in the bush and has been given particular emphasis in the FIRS programme. However, loggers said formal training was not the only way they learnt. There was also considerable scepticism about FIRS' effectiveness, particularly amongst woodlot loggers.

It is pertinent to discuss how loggers learnt traditionally in the bush, what they thought of FIRS, of trainers, and of the various ways formal training was implemented. What they thought was the best way to learn to log, how other factors influenced training, and how well learnt skills were utilised will then be discussed. The selective code was identified as **perceptions of learning**. Axial codes derived from the open codes are: **learning in the bush**, **views of FIRS**, and **maintenance of training**.

Learning in the bush

FIRS was not accepted by all loggers and there was considerable antagonism towards formal training. Learning less formally continued in many crews.

- *Holding on to the past*
- *Learning takes time and is ongoing*
- *Lack of help*
- *Trial and error*
- *Observation*
- *Guidance and instruction*

Holding on to the past

The past was seen as a harder time, and yet more glamorous. The resourcefulness, strength and courage of the old loggers, and the difficulties they faced, had a high place in the minds of many loggers. *"You know the gear they used to have, like the bullocks would pull a big sledge loaded up with snatch blocks and winches and timber jacks! A terrific amount of stuff they used to have! Ohhhh... it was for big trees. Like the bullies [bulldozers] they have today wouldn't move those trees. And they used to have teams of bullocks and all the blocks and the bullocks would be pulling downhill but they would be dragging the logs up hill... some of the blimmin blocks I couldn't pick up, they were all bloody iron. They would grab them with one arm and swing them around, great big bloody things, snatch blocks and double purchase, some of them triple purchase blocks. Ohhh man!!... And I would go with the old man, and watch it all, soak it all up. Watch and learn. It was the way then. The best way to learn is to take a few hard knocks and also try to do what the men were doing."* This reverence was also for the way the old loggers learnt through experience and hardship.

Learning takes time and is ongoing

In the Forest Service days a newcomer was usually assigned to a more experienced worker. The young worker served an informal apprenticeship, taking time to become familiar with the myriad elements of a bushman's job. Crews could be run profitably and still afford an 'apprentice'. *"My boss with the Forest Service would just take me aside and train me without worrying the production of the gang - which is something that doesn't happen often now."* Workers still aware of this need claimed that modern training was rushed through... *"those same guys from Murupara with thirty odd years of experience, they said it's a time thing, all these things come in time, like felling. You don't go out felling like some of these young fullas and expect to get the module next week sort of thing..."*

The sentiment that you learn by doing, and that this takes time, was especially strong amongst older loggers, and those who had learnt on-the-job. *"A good cross cutter takes ten years to learn ...in ten years I learnt about 90%. Some guys might take five years to get that far. Myself, I feel really confident, after ten years and I can make a really good judgement call - in a split second."*

Catania (1992) suggests that in highly skilled performance, behaviour must be sensitive to consequences that are changing from moment to moment. He says a wood carver is

constantly adjusting his chisel to meet the changing patterns in a woodblock. Likewise a skilled chainsaw operator must be acutely aware of the shifting tensions in a loaded windthrow tree as he moves the bar of the saw through the trunk. Though the process is not necessarily conscious, the subconscious is assimilating new information. In time and with a variety of experiences, expertise is gained.

The danger inherent in unpredictable blocks emphasised to loggers that learning never ceased. Plantation forests such as those run by the companies, did not have the same variation and unpredictability as woodlots. "...the average size of [plantation trees] over all might be two ton whereas the average tree we're doing would be twelve ton, and I've spent quite a bit of time in plantation forest... and I've also done native... there's not many ways of logging in plantation forest but every native bush is different... woodlots is more comparable to native." FIRS was developed largely for plantation logging. Most contractors who had become committed to FIRS and saw it as satisfactory, worked in company forests. Woodlot loggers and more traditional company contractors claimed trainees could not learn to assess trees properly by doing FIRS, but that loggers had to assess so many trees that over time it became almost automatic. Loggers said this was 'reading a tree', and that it was the key to being a competent and safe logger. "They can do all their cuts perfect 100% but that's not the problem in the bush, that's not gonna save your life, it's reading the tree, knowing what that tree's gonna do before you cut it..." And inevitably woodlot loggers felt it was more difficult to read trees in the steep woodlots. "... over Te Hau you gotta read every tree... you still read the tree [in production thinning plantations]... make sure there's nothing hanging in it, have a look, make sure all the weight isn't on one side, but with woodlot trees you never know and they are a lot bigger so they could be doing anything at the top there... you gotta know how to read it."

Lack of help

In the past many workers were not formally trained. "I had no training in Timberlands. I just arrived and they said 'There's some gloves... go down, leave your brain at home and stay wherever I am.'" There were still crews where no help was given to a new worker. Contractors claimed it was difficult running an operation and being responsible for guiding an inexperienced worker, and as a result they allowed learning to occur ad hoc. "Someone will have a go at driving [a loader] and that's the only way that guys are getting training ... I don't have time to really train them." Well organised contractors found time to supervise

new workers because they structured their operation to allow for observation and guidance. But even the most efficient found it increasingly difficult to do so because of growing production pressure. While in the past crew numbers might be kept at a certain level, at the time of the interviews workers were not necessarily replaced when they left. Those remaining were expected to work harder to ensure the crew reached the same target. Consequently less training time was available.

A crew's culture could determine the kind of help given to a newcomer. *"A crew would be like a family so when an outsider comes into your family everybody sort of don't want to know him... Everybody keeps their distance and when you've proved your worth everybody sees that you're gonna be all right. Eventually the older guys will give you a few tips. It depends on your attitude, not just whether you can work but what sort of a bloke you are as well...if you got the wrong sort of attitude when you walk into a gang then you're fucked before you start."*

Trial and error

Even in crews where formal training was accepted, trial and error was seen as an important way for loggers to learn the complexities of logging. In the fringe woodlots this belief was most pronounced. *"Like it's just trial and error and okay it's a bit harder to pick up some of the stuff you need to learn but if you compare it to how some young guys today learn, I'd say it's better."*

Loggers recognised that they learnt a lot by making mistakes and accepted that danger was an inevitable part of learning this way. *"I started by doing post cutting - you learnt the hard way - either got fucking murdered or got another job... You either learnt or you didn't. They point you at a tree. 'There's a tree. Go and cut the bastard down and cut it to length and stack the bastards into heaps for posts...' "* Many considered it the only way to earn status as a 'real bushman'.

Trial and error learning was illustrated too in the mateship of pondering a big problem together, discussing the options, inventing new alternatives. *"They feel free to make suggestions about how to go about it... so we sit there and do a bit of planning though we've been doing it now so long together that really we don't need to say too much.... but yeah it's a thing we have developed over the years. You're mates with the guys and you plan and poke*

around the problem, think up some crazy ways to do things sometimes, but with some of these trees you gotta sometimes be pretty radical and it's a bit like being in a team I spose. There's no room to bitch and moan cause you're all in it together." In big plantations the uniformity of trees reduced such a need. In the woodlots huge old pine and macrocarpa trees sometimes grew in difficult positions, and careful planning was desirable. Loggers talked of the bonds which developed in such situations.

Loggers said trial and error learning challenged them to think, anticipate, experiment and be aware of potential danger. Additionally, by honing their skills and experimenting, they could reduce the onerous side of the job. Young loggers saw older men who, despite having lost their youthful strength, had developed methods that enable them to continue working hard. *"I don't know whether he's fifty or not yet ... There's three of them that age and I was twenty one and absolutely exhausted and they're still working, just cruising along. I was just bewildered. I was knackered and I was sposed to be young and fit. See it's that way of picking up the techniques as you go along. And the techniques help you survive and do things with ease... You can't teach that, it just comes with experience."* Many loggers believed the job was being compromised because trial and error learning was not promoted by FIRS.

Many of the contractors started with the old way of learning and they were often the chief proponents of the trial and error method. However, they acknowledged that in the past there was more leeway to learn. *"I trained myself... I was given the space and the time to learn. I started with an axe, trimming on the landing. The contractor had between 11 and 14 men, based on a ten man operation. There were always two or three in his crew who were young guys coming up through the ranks... I guess there was room in the cash flow somewhere to have extra guys."*

The extent to which trial and error learning presented risk to a trainee depended on whether the trainee could learn gradually and systematically, even without instruction. Woodlot crews with few workers, and ill-defined systems, presented a high chance that the errors would produce accidents. Workers related situations where they were thrown into a job and learning was often extremely dangerous. *"It was all just pretty crazy like trees would just go everywhere and we didn't give a shit... the boss didn't notice... we just gave it a go. You learnt off the seat of your pants sort of thing ... like I remember one day... I got my saw*

stuck in a tree and... I said 'You grab my saw and I'll drop the tree behind it and you grab the saw and pull it out,' which we did, but we survived, but that was a common occurrence."

While learning from mistakes was valid, there was less chance a worker would be injured if his experimenting could be at least partly linked to instruction and observation of skilled workers. If there was time to experiment, trial and error took on a different meaning. The same mode of learning was not feasible under production pressure, where major mistakes could result.

Observation

Older loggers were often introduced to the bush by a relation, at a very early age. They observed the older men preparing sites, felling trees, and processing them. They became familiar with the ways of the bush and learnt without the need for instruction. By the time they attempted a skill they had watched the process many times so that their learning was not pure trial and error. The young worker would have assimilated many 'rules' about skills. Josh, a logger in his fifties, went to the bush while at primary school. His father still used bullocks to drag logs from the bush. *"Yeah well muck around and watch them - we used to have to take the bark off the kauri trees with the back of an axe...and then they would slide it along the ground - yeah just watching, you sort of go and watch and make a lot of mistakes. Pick it up, and there were some very skilled men to observe."* A proactive contractor would still put a trainee with an expert bushman to learn from observation.

When a newcomer was trying to gain acceptance, he usually watched and copied an experienced worker. He sometimes suffered derision from the older workers in the process but it was a rite of passage and encouraged younger workers to respect experience and expertise. It also perpetuated the old way of learning and reinforced the general crew culture. When FIRS training was done at a course, or via a trainer, this method of establishing a hierarchy was threatened. *"We got a young guy ... he's got more tickets [from a course] than the rest of us put together... but this guy with all the tickets, we got him on the end of the wire rope...because that's all he can do."*

Observational learning occurred at all levels. An experienced worker who had never been in windthrow until recently related how he deferred to those who had the knowledge: *"They had a windthrow in Gisborne and we learnt the cuts in that from those fullas. We were following them and watching them and limbing the trees that were down. All the hard stuff they were*

doing - they'd go in there and do those and we would watch. Now I spose if I got a bit of cutting experience again I could go in and do windthrow." There were many variations, unknowns and consequent dangers in jobs like windthrow, and suitable training was difficult to put into a structured format. In windthrow resulting from Cyclone Bola in 1988 there were many accidents, several of them fatal. Loggers contended that no amount of formal training could have prepared them for the conditions that prevailed at that time. They said only the very experienced loggers managed the felling well, and those who were able to learn under their guidance were very fortunate.

Guidance and instruction

Instruction sometimes accompanied observation. The 'instructor', usually the contractor, sometimes explained to the worker while modelling, allow the worker to try, then observe again with more instruction, and so on. However, loggers are relatively taciturn and as often as not the modelling was incidental with no instruction.

Much instruction in the bush was contingent on situations arising. Usually the 'instructor' allowed the trainee to watch him and then instructed on an ad hoc basis as the trainee attempted to emulate his technique. *"I try to pass on as much as I can to the other guys ... if you see a guy doing something wrong you go over and tell him because you don't want him to have an accident cause the way he's working is not right - his system or his technique - especially if you're experienced...but only if I can get a break from when things slow up a bit."* If the teacher was astute he would nurse the new worker into full production.: *"This guy with thirty years experience used to show me - he was good. Make sure you did it right and have the skills and that sort of thing... That's what they say about time - you learn these things and the fulla who is with you - he'll take the hard bit and slowly work you into it - and talk about it and show you - you stay on the nice easy bits and make sure your cuts are right."* But there were many instances where younger loggers reported that the older man training them was not very good at imparting information. *"I found Al hard - I did know how to fell, but didn't know the way to do spacings and take out the trees so you leave gaps... Al explained it roughly then said 'You go over there and I'll work here and we'll just move up' and I said 'Ohh yeah' but I didn't really feel like asking too many questions because he had explained it to me but I didn't understand."*

Usually a novice began on the skid, where there was less danger, while they get used to a saw and the ways of the crew. A reactive contractor might guide reluctantly but proactive contractors kept an eye on new workers, ascertaining when they were ready to work more independently. *"First Murray felled ten trees to show me the style using the correct methods, telling me what to do, and then he got me to fell for the rest of the day while he was watching. I'd do a heap then we'd limb and he'd stop and watch me limb up, give me some more tips and when he thought I was constant enough he let me go for it and the skidder driver kept an eye on me."* At a certain point most contractors considered that learning was over and the worker must produce at a high rate. Others believed that instruction should be ongoing. *"When Basil's driving he quite often stops and gives you pointers. Mack's [the contractor] got no complaints about that... it helps everyone."* Much depended on the attitudes of the contractor and the learning culture of the group.

Workers sometimes had to rely on workmates for information if there was little guided learning. Proactive contractors encouraged sharing of information anyway. Sharing information was often seen as a symbol of 'mateship' and unity of purpose. *"If you see something that might go wrong don't put your mate in any danger or jeopardy - look after your mate and go for team work. That's important to me because I would assume that it is also important to the other guys too - just looking after one another and taking a bit of time to see your mate's okay."*

Some contractors believed that well trained workers would produce more quantity and quality, and at the same time work more safely. They promoted training, and directed experienced workers to assist in this process. Well organised contractors sometimes combined a variety of jobs such as filling in for absent workers or helping where a backlog had built up, with giving advice and assistance, particularly to less experienced workers. *"...he would take time out to show you how to do it - it was no problem for him to spend that time. Then he would carry on what he was doing - walk around doing a bit of this and that, helping people and telling them so they are doing it right."* This guidance was less structured than formal training, but it was the contractor's reaction to what was happening in the operation. Thus it was more flexible and more sensitive to individual situations. However, instruction often required a logger to leave his own work and it was in pressure situations that both formal training and experiential learning were least well implemented.

Points of discussion

Loggers aspired to the traditional image of a bushman. They felt it was their heritage, and that it represented their worth as men. The myths of the bush helped maintain antagonism towards formal training which made the task of promoting formal training more difficult. In traditional logging there was a belief that learning to be a bushman took time and a variety of experiences. Loggers maintained that FIRS did not train for subtle variation of tasks, was too standardised, and ignored techniques and expertise built up from the old days. Loggers with this belief were reluctant to change, and referred to their own experiences of learning as support for their arguments. These beliefs remained prevalent in many instances and thus traditional ways might be the only acceptable form of learning in certain crews.

The novice sometimes had to learn how things worked for himself. In time he would be accepted and more likely to receive advice and assistance. There was a variety of learning processes evident in the bush. The amount of help offered, and the extent to which one mode of learning or another dominated, was strongly influenced by the contractor's perceptions of what training constituted. While some contractors had no time to train and so relied on the worker learning for himself, others refrained from offering assistance more deliberately in the belief that the best way to learn was through mistakes and observation.

Nostalgia for the old days encompassed not only what loggers learnt but the social situations in which they learnt. Such nostalgia could create biases against modern methods. Some older bushmen also had a vested interest in defending such beliefs. It gave them status and a high place in the hierarchy. Trial and error, imitation, and sharing of information remained highly regarded forms of learning in the bush. Because the experts, who had usually learnt in the old way, were revered, the value of this style of learning was further reinforced. However, while observing and being instructed by an expert on-the-job was the ideal, the realities of the present economic climate of the industry meant there was little time for the traditional way of training. This approach to learning was now only fully implemented by contractors who not only appreciated the need for careful guidance but had the luxury to afford the time. Many loggers were either not aware or would not acknowledge that increased pressure to produce reduced the time available to assess and discuss danger the way it was in the past when there was more time. Because of this pressure and lack of time to learn slowly it might be important for trainees to learn via the new system, if only to complement more traditional learning methods.

Perceptions of formal training

- *Views of FIRS*
- *Views of pre-entry courses*
- *Views of formal on-the-job training*
- *Views about trainers*

Views of FIRS

Many older loggers were especially resistant to FIRS. *"These are the old die hards and that's the way they'll stay probably. I was talking to an old guy last week and he's going on... 'They don't need bloody tickets... bugger them, who needs tickets'. He's an old logger from way back. He won't change... Of course he passes the stuff onto his men."* Workers often took their cue from the contractor. Some contractors acknowledged the value of the old ways and still promoted the positive aspects of FIRS. But equally, many denigrated everything about FIRS, and this negative stance influenced the workers.

Holding onto the past was not an immutable rule. Some contractors who now adhered to the FIRS programme, professed to have once been 'cowboys' who ignored the rules. One contractor, who OSH inspectors said was among the safest in the country, claimed: *"I used to do a lot of very dangerous things for my own sake like climbing trees with no branches just to get a rope round it so you can pull them over. Just so you could keep the job going ... there's been times when I've been 50 feet off the ground with all my weight on a pine cone. The next step had to be on another pine cone. When you're young and enthusiastic! And where we used to take machinery! That's probably where there was a bit of cowboyish stuff."* He had come in contact with the new notions of safety and training and had deliberately cultivated safety consciousness in his crew. He had dispensed with the belief that learning only comes through experience.

Loggers claimed there were skills required that were not included in FIRS *"I've picked up some things that aren't trained that we're not allowed to do but sometimes you need to use them. Sometimes they're safer than the new way. There's no doubt about it, it's good to learn from the good bushman who has had years of experience, not some mug... I'm talking about a common sense guy... He will teach you things the books won't have in them and sometimes that makes all the difference. Yeah, a good bushman with knowledge of the old*

ways.” The last part of this quote, ‘good bushman’, reflected a preference to learn from an experienced bushman, even if he was not formally trained.

Because FIRS was the benchmark for OSH, there was pressure to get at least some modules anyway. Forcing older, experienced loggers to sit the modules designed for beginning workers, had added to their resentment. “*Some of that stuff is an insult to our intelligence. It's okay for a young fulla just starting out but for someone who's been in the bush for twenty years it's a bloody joke that we have to sit down and learn it.*” Several loggers, both workers and contractors, largely from the Far North, had had very little to do with the modules. Most loggers had seen the booklets, but many had not read them thoroughly. Some refused to because they gave FIRS no credence. “*I can't be bothered with it. It still wouldn't train you right if I did go through it. Nothing like cutting something down and getting a bonk on the head and learning about it.*” This typified a reluctance to find out about the training, a stance which was strong amongst the fringe crews.

The lack of clear understanding and familiarity with the FIRS system did not prevent loggers from having definite views about formal training. FIRS was meant to be a set of standards that recognised basic competence. It was not assumed that a logger, having passed a module, would be considered an expert in that field. However, many loggers did think this was the intention of the modules. This misconception existed partly because the companies, OSH, and LFITB have overemphasised the importance of the modules.

Loggers said knowledge of logging could not be learnt from a book. “*The fault is, ahhh, there is not really enough practical [in the training system]. Work in the bush is practical, you don't get it from reading a text book eh? It's really practical mate, there's no other word for it.*” Some refused to have anything to do with FIRS, believing it was devised by academics with no understanding of the bush. They were not anti-training per se, but believed that no matter how elaborate the book was, it would be inadequate.

Others thought FIRS should only come after practical learning. Some contractors did teach their workers the basics when they first arrived. “*You can only teach them the basics then it's a numbers' game so that when you've done ten thousand you're a lot better than when you've done only one thousand - that's all it is.*” Loggers contended that without practice first, written material meant nothing. “*... you know you gotta friggin get on the saw and*

learn it yourself - you can't just go in a classroom and do it then jump down and cut a tree down or anything... the way I see it is there are fullas go for their stage one in the classroom for a couple of weeks and learn it off the blackboard or whatever and then go in the bush and cut down a tree and ohhh it's just beyond a joke. These idiots are gonna slice someone's leg open then where will their tickets be?" The link made between classroom based learning and accidents was common, largely based on hearsay.

Many in the workforce said the books were too academic and wordy. FIRS had been drawn into the standards and criteria set by NZQA. The designing of FIRS modules had gradually been taken over by administrators without logging experience. They acknowledged it was difficult to ensure appropriateness for loggers and yet meet a format and style acceptable to NZQA (G. Steele, 25th November, 1997, personal communication). An older logger from the Central Plateau compared it with the much simpler booklets of the Loggers Certificates. *"Well it seems that they've put a whole lot of stuff in there just to make the book look nice and thick - fat - I mean years ago it used to be a really basic book and to me that's all you really wanted."*

Loggers with little formal education sometimes found the content difficult. *"You look at the questions - big long questions and you don't even know what they mean - you can't understand what they mean like you read some of those questions out to an older logger and he wouldn't understand what the hell they meant and yet he's a really good logger."* It could be difficult producing a course with written content when formal education was an anathema to many loggers. They could be scared of the modules, and at the same time angry that their experience was not accepted as enough, since it had stood them in good stead in the bush for years.

Contractors with a proactive approach to FIRS were generally more disposed to help workers with reading. They found time in the smoko hut or work vehicle to go over the modules. Additionally, they made allowances for the aptitude of the trainee and adjusted presentation to reduce confusion. *"We got a couple of guys on our job who can hardly read and write but...I go through it with them and... once you understand their lingo - a lot of it is broken English. They don't know what a compression wood is - but they'll bloody show you on a log - they can show you where it's compressed or tensioned."* When there was this kind of assistance a more positive attitude to training was fostered.

Younger loggers found FIRS easier, especially if they had attended a pre-entry course. Many loggers had passed several modules and liked the content. *" Yeah they're pretty good really. Like easy to follow and that and you know, you go through them with a mate or that and it all makes sense. Well we passed the tests okay. I reckon they have all you need to know to get you started and then you'll pick up any extras as you go."* But even loggers who favoured FIRS usually felt that it was wrong to rely only on them.

FIRS had a large safety component. Emphasising this was initially up to the trainer, and subsequently the contractor. Without FIRS, 'training' often had little safety content. Contractors who focused on production, giving safety little or no attention, tended to favour learning by experience. Their concerns that the modules were simplistic and oriented towards plantation forestry might have some validity. However, part of the negativity stemmed from the belief that the modules were meant to represent expertise rather than the minimum standard. In regarding FIRS as inadequate or irrelevant, contractors also dismissed the safety content. Those contractors who appreciated that FIRS was only the minimum and that ongoing learning through experience was required, were more inclined to take an active role in continued guidance. They ensured useful experience was gained and safety emphasised.

Views of pre-entry courses.

Increasingly, pre-entry courses were the method for getting into logging. The emphasis in pre-entry courses was on 'technique and safety' rather than 'production'. Trainees joining crews were rarely 'up to speed'. Consequently pre-entry training was judged to be inferior. *"You can pick any guy with all the qualifications in the world, he's through polytech, ... and my guys aint got no certificates - I bet you nine times out of ten my guy will work as good - in fact he will put everyone of those guys down. I aint interested in how many courses they've sat - it doesn't mean squat to me - what's means squat to me is whether that guy can do the job adequately and well - that is more beneficial to me than a hundred qualifications - my guys probably wouldn't mind going on those courses - and it would be beneficial - but who pays their wages while they have the day off [to go the course]."* Within this quote were the essential elements of most loggers' opinions of pre-entry training: loggers who learnt on-the-job were superior, courses were an extra rather than a necessity, costs of training were prohibitive and the crucial issue was whether it was 'beneficial' to the contractor. The contractor referred to taking a day off to do the courses. This emphasised a perception in some parts of the industry that qualifications could be obtained in as little as a day, partly

because that was what did happen, but not in pre-entry courses. Loggers compared years of learning by experience with the brief courses and were not impressed. They then contended that all course training was too brief and theoretical to be useful.

It was typical for trainees to have had no experience with large or difficult trees. *"OSH said to my mate 'No you're not experienced enough', and [OSH said] he had to get someone experienced to do the cutting... So he gets three jokers from this forestry gang who've been through the course on chainsaws... [but] they'd had a struggle doing the cutting, and they'd had to get the guys who weren't allowed to cut to show them how to do it. [One of them] said 'Well we've only ever done prunings and thinnings and we never done big logs like this before, and we didn't know how to go about it.'"* Loggers often used such isolated instances to confirm their beliefs. On the other hand the forestry industry tended to encourage these attitudes by allowing such situations to occur. This situation illustrated the anomalies present in the training system. Understandably there was some indignation about the credibility given to someone with a piece of paper gained from a course. *"It's the people [LFITB] who run them because they come along and just give out all these papers and if the man does what's on the papers he's a good bushmen at the end of it... but if he meets the performance criteria in the book nine times out of ten he's useless."* Many contractors also resented having to pay for training for their experienced workers. They were unhappy that FIRS accepted someone as trained after as little as half a day when it did not acknowledge years of practical experience.

Another criticism of pre-entry training was the type of person on many courses. *"The polytech system is not as good because they take young guys off the street, first in first served. ...out of the 35 they had last year [at the local course] ... about six that got through, and only two of them are any good."* There was some validity in the notion that some students on the courses were not genuinely keen on becoming loggers. For instance the 1995 Manawatu Polytech intake was 30. Only 12 finished the course (R. McAslan, 20th Feb, 1996, personal communication). In many long term courses there was a high attrition rate.

Contractors saw students in action when tutors brought them to harvest operations for work experience, and many said the courses lowered general skill levels *"...we pay them to come and it's not worth it - seven young fullas and one trainer and these guys wanted to get out and do the real thing but two of the guys didn't want to be there anyway. One wanted to be a*

truck driver and the other one wanted to fly bloody aeroplanes, they were only filling in time and wasting their parents money...It's not good having those jokers on the skid site."

Consequently, many contractors would not employ students from courses. They placed great importance on the type of person they employed. This was generally more important to them than how many modules a worker had.

When a contractor employed someone from a training course they were often chosen while on a work experience period with the crew. *"I had fourteen trainees from the polytech and one guy stood out, so he was the one I employed...his work attitude really stood him out amongst the guys...and the way he did things - on the job first, working first, he listens, and picks things up really quick, and works all day. There's no pressure on these guys to do anything... At the end of the day he's not the first to take off or finish what he's doing, he keeps his gear all neat and tidy, and he was really meticulous even on his safety gear, brushing it down and folding it up... And every day for two months he never changed. Plus his work quality was good. I think he also got on well with us. I chose him and he hasn't let me down."* The contractor had observed the trainee and identified all the characteristics which would make the man a good worker, whether he learnt in the bush or on a course.

Whether a trainee had modules or not, the contractor liked to disparage the value of formal qualifications by suggesting that the 'real' learning was still to come. This ensured he retained his status in the crew and industry, and also ensured that the 'control' of the crew remained in his hands. However, as pressure to produce increased and contractors were less able to allot time for training, and on-the-job training became less affordable, they were sometimes forced to accept trainees who already had modules. Some contractors found this hard to accept, saying it was forced on them by circumstances, and they remained adamant that it was an undesirable choice. Others though, adapted and began to view pre-entry courses more positively.

Views of formal on-the-job training

Loggers might go through an induction course to be allowed to work in the forest. *"There were seven on this four day course - introduction to the chainsaw. He gave us these leaflets and we had to read it. They gave us quizzes and this was the first day. The second day they brought out the chainsaw and showed us the different parts of it and how it worked. On the third day they got us to start the chainsaw up and familiarise ourselves with it. On the fourth*

day we had blocks of timber up at the fire depot and they made us do scarves and back cuts and then we went out to the bush and did actual felling, and the following week we were into it." The course described above was more thorough than some. With short, on-the-job 'courses', the trainer arrived, demonstrated techniques, ran through the written material, ensured that the trainee was focused on the correct skills and then departed after as little as four hours. He came back for one or two follow-ups in the next month or so, and then, providing the trainee was ready, assessed him for the module. Whether any interim training was carried out depended on the contractor.

Inexperienced trainees often began felling trees after a short course. Experienced loggers considered this the wrong way to learn. *"Any trainer up here teaches you to start a chainsaw and do tree felling but the first thing a chainsaw operator should learn is to work on the skids - I was there for a year before I did cross cutting."* When a crew was under pressure to produce logs training in many instances became a matter of pragmatism. It was considered preferable that workers were eased into the job. But when there was a need for fellers, minimum training was provided before inexperienced workers were put straight into felling.

In some areas, woodlot loggers had to learn from the module booklets and then contract someone to assess them, because trainers were unavailable. Among woodlot contractors, wanting to get involved in the FIRS system, there was a sense of helplessness and frustration at the lack of facilities for training, and yet companies demanded trained crews. *"No training, nothing - they don't have any trainers down here - I have to get the polytech tutor or the LFITB moderator to come. I have to pay them to do the assessment. I make sure the men are trained but I haven't got any modules. The polytech tutor comes out to us ... Carter Holts said last Christmas: 'Well we'll have you doing fire training'. But they never came."*

In some companies training was carried out by company trainers who were assigned a group of crews. The size of the companies allowed efficient and full use of trainers. Because the contractor did not have to pay he was less averse to regular training. Some contractors acted as trainers in these situations and considered that training took more than just a quick visit once or twice. *"Most of the training is done in most gangs from the guy's own experience. What I've always done is spend quite a bit of time with them myself. We put a fair bit into it - it's not just a few hours we put into the guys - that would be inadequate. We only might spend a few hours with them to start off with but it's the follow-ups that turn him into a cross*

cutter. You ask 'Why the hell did you fall things this way? You should have been putting things this way.' And explain the reasons and if you treat guys like that and they see you spend time and money to train them they'll listen and appreciate it. You keep tuning them up. You find you fix one thing up and in the meantime they'll develop a bad habit elsewhere, which you then gotta keep working on." The contractor touched on an issue which was rarely addressed in the formal training programmes: follow-up and maintenance. Unless the trainer was available most of the time, he did not have the opportunity to provide the necessary adjustments and reinforcement to maintain the worker's skills. Unless the system promoted contractors as 'on-the-job' trainers, financial restraints were likely to prohibit maintenance of skills.

If the company paid for training the contractor was less likely to push it through quickly. However, in the months following the demise of the company training system in Kaingaroa, newly independent contract trainers had only a fraction of the work they had had as company trainers. Contractors were concerned that they would not be able to afford training. *"The other day one of the trainers come down just to have a look at the cross cutter and the trainer said to the boss 'Well you'll probably pay your fuel bill before you pay me,' and the boss said 'That's dead right.'"*

Views of trainers

In the early days of LFITB expert company loggers were seconded as trainers. Trainers were required to have passed the modules they were to teach. In the bigger companies there were enough trained loggers but in small companies and the woodlots, finding qualified loggers was difficult.

Some company trainers were rejected by the contractors. *"The company they hired this trainer and we had to pay half. He was a bloody idiot - they sacked him in the end. He knows all the guideline booklets but all my guys and I thought he was a bloody idiot - he would arrive unannounced, decide what he was gonna do, not what we wanted and he knows nothing about machinery, yet he's a National Certificate [holder]. He would go on about over cut stumps and under cut but you watch him do one - he'd still make a mess. He's one of the guys who, like a lot of others, have National Certificates who shouldn't."* Workers in this instance got on a lot better with the trainer who they say emphasised safety and reduced production pressure. A worker from the same crew said: *"The bosses don't let us go for*

training. It was too much downtime ... I got on all right with the trainer ... The bosses hate him. They think he's an idiot but he was all right ... But he had to tell the bosses what to do sometimes - said the cutters were cutting too close together which they were... " There was conflict between the demands of safety in the training system and the needs of production. The bosses attributed the conflict to the inadequacy of the trainer but the worker felt that it was because of the likelihood of reduced production.

Most contractors, whether in woodlot or company crews maintained workers were there first and foremost to produce. Even contractors who would have liked to support intensive training were faced with the realities of production. Thus while theoretically formal training could be in place, in reality a lot of learning was unstructured and occurred in a variety of ways.

As production pressure increased contractors became concerned only with getting the minimum requisite modules for each worker. Emphasis was on certification rather than skill accumulation. Workers in such situations felt helpless to do anything about it. *"I have General Requirements, Chainsaw Maintenance and Driving the Hauler. I was meant to get my Splicing too and the joker come up to do it and the boss sent everyone home and he did four or five modules himself in one afternoon - probably paid for them [a reference to the ubiquitous rumour that modules can be bought from trainers]. I'd like to get the modules while I'm there and have the chance. I wish someone would make the boss make us get them."* Workers sometimes saw qualifications as an opportunity to escape to a better crew.

The introduction of pre-entry courses brought new problems. In the Far North, pre-entry courses were run by trusts. Trainers were expected to have the modules but logging experience was not necessary. *"A lot of training providers - they've never really had the hands on experience... and done the job to be able to say this is what you should do ..."* In the Far North, contractors and a lot of workers were scornful of the programmes, believing that the tutors were inadequate. Conversely, in Manawatu\Southern Hawkes Bay and the Central Plateau, pre-entry training was mainly through polytechs. Trainers were usually experienced and qualified, and were viewed more positively.

Loggers who had done pre-entry training were less scathing about the tutors, though they recognised some were better than others. *"Our tutor was the best in the whole polytech. My brother was working with another tutor at the same time and his tutor was useless. He*

didn't teach them anything, he just stood over by the van and left them do things themselves. I was working with Ricky and a polytech work experience group came out to do work with our gang. Just watching their tutor compared to the one I had - he wasn't really interested in the boys. He'd walk around with a stick round the road and down the bank. Our tutor was right in our face while we were cutting like he was one log over and he would make sure we were cutting straight and... he would whack us, like not hard, but just to remind us to put our thumb behind - but he was right there and he just drummed it into us - it was good to learn the right way the first time but some of the tutors were real slack." They appreciated that good tutors were there to guide and advise them.

Good tutors used a mix of instruction, modelling and contingent learning, monitoring the progress of the trainees and adjusting training methods to suit. *"The main thing is they emphasise the chainsaw safety and maintenance and they drum it into you - they give you books and they do a lot of talking. They show you. They give you a saw and tell you to strip it and then they give it to another guy and he's gotta put it back together again and the tutor is always walking around keeping an eye on you and ready to answer any questions... On some days you wouldn't even talk to the tutor. He would stick to the other guys because we only had seven guys and two guys in our gang took longer to get things sussed. That was good for the tutor cause he could spend more time on them."* The tutor was able to allow the more adept students the opportunity to build on their experience and expertise while guiding the less capable students more closely.

Points of discussion

To be accepted in the crew newcomers usually needed to take on the beliefs of the group. Many older workers still used the old techniques, whether they had modules or not. However, the company systems encouraged acceptance of formal training so that adherence to the old ways was most likely in woodlots.

Loggers said the FIRS system could not possibly cover all skills and knowledge required in logging, especially in the woodlots where there was greater variation and unpredictability. Verhaegen (1993) suggests jobs with variation have a higher level of danger and it is reasonable to assume that with such variation more time is needed to master appropriate skills. There was resentment about the new system because it was perceived as promoting learning mainly from a book and this was believed to degrade the quality of learning.

The belief that trainees sat in classrooms reading and writing confirmed loggers' fear that the bush was being taken over by bureaucrats and academics who did not understand logging. Many loggers said they hated school and wanted the learning process to remain exclusively practical. In the bush they had experienced success by achieving at a practical level and they felt angry that training was being drawn into the academic education system. But there was growing acceptance that without at least some evidence of formal training, winning contracts and avoiding prosecution were more difficult. Contractors were forced to provide some formal training. Thus FIRS often gained a foothold through force of circumstances.

There were misconceptions about the role of FIRS. While it was introduced to set a minimum standard, graduates were judged against an expert standard. This had implications for maintenance of skills. Contempt for FIRS courses was not necessarily justified. Courses did place emphasis on practical skills, and some courses were held mostly in the bush although not as much as loggers would have liked. While loggers often denigrated the abilities of courses and trainers they forgot that ideal learning conditions and training personnel did not necessarily exist in on-the-job training. Course programmes had to match Education Training and Skills Authority (ETSA) requirements. Hours were restricted to thirty a week, production was not emphasised to the same degree as in a production crew, and the theory of skills was stressed.

Contractors usually expected all their workers, trained or not, to produce to a certain level. If the operation was barely meeting targets there was little tolerance for new workers who needed time to get 'up to speed'. Contractors considered trainees from year long courses should be able to produce as well as someone who had been in the crew a year. Because pre-entry programmes focused more on safety and technique, and not speed, few trainees left a course with the ability to immediately satisfy such a demand. The tension between expectations was exaggerated by the reduced profitability of many operations. The prevailing crew culture tended to reflect the influence of the contractor and thus he was instrumental in shaping general attitudes towards training, and particularly its safety component.

Maintenance of the training

The value of training was greatly dependent on how well it could transfer to the job and be maintained.

- *FIRS does not have built in maintenance*
- *Follow-up by trainers*
- *Company supervisors*
- *Contractors*
- *Factors which conflict with training*

FIRS does not have built in maintenance

Cohen (1977) found that follow-up to training was very important for improving safety levels in industry. However, FIRS had no built in system which ensured learning was maintained. Some loggers suggested there should be spot checks to ensure loggers did not lose techniques. *"I understand now with these modules and tickets and Earl [the bush inspector] or whoever, they're not gonna come round and see whether I'm keeping up to the standards and requirements ... I reckon they should be, because everybody lapses a bit in their work... A few fullas mightn't admit it, but I know myself that I make a few mistakes."* Once qualified the logger was presumed competent for life. It was not until there was an accident that it was likely the bush inspector would question the techniques used.

LFITB staff insisted that loggers would continue to use the correct methods because they were the best and fastest, and therefore self-reinforcing. Most loggers disputed this and said in many cases they were not the fastest way to get production.

Follow-up by trainers

Good company trainers called on crews frequently to assess the need for extra training. *"We would go round our group of crews every couple of weeks and keep the training flowing - make sure if a fulla was low on his skills or getting a bit slack you'd bring him up to scratch. Have a yack with the contractor and pin point any lapses, or bring in some new skills. But like keep out of the way of the other fullas so you weren't delaying production. That way you kept the contractor on side."*

'One off' training sessions provided for assessment but not follow-up. One trainer in the Far North, for instance, was paid to assess once. *"I've got no training at all now through Jukken*

Nissho, just assessments. Now they made it a rule just a couple of weeks ago that in assessment if the guy fails you will not get paid. That's why I pulled out. That's why I said 'No, I'm not working for you under those conditions.' ... And see if the boys are slipping well I'm not gonna see them. It's okay in these crews ... where the trainer is round all the time, and for that company, money doesn't get in the way of safety, but see Jukken Nissho just wanna cut costs so they just want the letters after that man's name then that's it." In tight economic times, when a trainer charged \$500 a day, the contractor was unlikely to ask for follow-up. But even when a trainer did come regularly, the contractor's co-operation was needed to ensure long term skill maintenance, because it was up to him whether the trainer's systems were adhered to.

Company supervisors

Part of a supervisor's job was to ensure training and safety systems were maintained. Supervisors I spoke with were adamant that this was stringently carried out. But the reality seemed somewhat different in many cases. On several occasions I observed supervisors ignoring breaches of the regulations and the use of techniques deemed unsafe by FIRS. For example, at one skid site the supervisor insisted loggers in his crews never drop-started their saws and yet I saw this occur in his presence.

Nevertheless, company supervisors did frequent skid sites and their presence had some effect on the loggers' performance. *"He would come round and watch you for a while and put in his pointers but it was mainly to keep his eye on you. It's just little things like our cutting positions and I always had my left foot in the way which was totally safe if you made the cut properly but if you got a kickback then that's when you got your cuts and nicks. Like in previous employers you never wore chaps or hard hats when you're cutting... But in some ways he lets you get away with things. He's not too strict and once you are established and have the module he stops worrying about you. I spose he sort of leaves it up to Melvin [the contractor] then."* Often supervisors checked equipment but not safety techniques.

Some supervisors were reluctant to be strict. *"They watch us but they have never come over and checked our gear or anything. They will come over and have a yarn with you but they've never checked our gear. And they don't look to see if you're doing your stumps right or that. Or if you cut a scarf... but they don't really do much, and they only want to have a talk really."* The supervisors wanted to remain friends with the crew and as with bush inspectors,

it was easier to deal with things like faulty equipment than to observe and assess safety skills. Maybe because of this, maintenance of training was often left to the contractor.

There was concern about the trend towards a reduced role for supervisors *"It worries me a bit to read that as the contractors are becoming more involved and more professional there's actually less supervisors out there, the companies are employing less logging supervisors and the contractors themselves are doing a lot of the work themselves."*

Nevertheless, in company crews, ignoring safety skills learnt through training was generally not as prevalent as in woodlots, which indicated that the supervisors' presence had some effects.

Contractors

The contractor fulfilled the role which might, in a factory, be taken by a supervisor. In a small group like a logging crew he was usually the only authority. Hale (1984) notes supervisors are rarely trained to monitor and encourage safe behaviours. Likewise in logging there were no training programmes which taught a contractor how to foster safety in his crew. Whether he kept a strict eye on his workers depended on his perceptions of the training programme, of safety, and of the need to maintain safety skills.

Certain contractors would often keep an eye on a new worker. *"Murray was there the whole time keeping an eye on me... I picked it up pretty quickly but he wanted to keep me on the skids especially to build my endurance up, because... I came out to Murray in the middle of summer so my endurance to the sun was pretty low... then after a month I ... started felling and he was out there for the first two weeks with me, then he put me under another guy [who] keeps an eye on you"* It depended on his attitudes to skill maintenance whether he continued to guide the worker after this induction period.

Many were lax but presented a facade when supervisors or the bush inspector were there. But there were contractors who put considerable emphasis on maintenance of good methods. *"Like Ben will keep you on the ball though. He will come round and make sure your technique's spot on. Put safety first. He says you gotta keep working on the skill levels and like he will encourage Barry to give me tips, or pull me up if I get slack... Even the older fullas he will have a talk at smoko you know - keep those skills up."*

On the whole contractors were not systematic in reinforcing and maintaining skills and in most cases any emphasis was on production rather than safety. Providing a worker tried hard, did his best and contributed to production, a contractor did not tend to worry about the more precise technicalities. This related, at least partly, to the continued belief amongst so many loggers that learning came best through experience, and that loggers would develop their own style. It seemed that only those contractors who managed to keep their operations running efficiently had a positive attitude to safety. Because they were efficient they could afford to take regular walks around the crew and could thus regularly monitor and reinforce safety skills.

Factors which conflict with training.

Loggers suggested that however they may have been taught, if most of the crew members had bad habits then such habits were likely to affect their own techniques. Further, while a visiting trainer or supervisor may have tried to maintain training, there was often peer pressure within crews to scoff at formal methods of learning. *"You get these guys and they give you heaps if you want to do it the proper way. You are trying to remember those things Ricky [course tutor] taught you and they are giving you arseholes. They will even give you a smack in the head if you are too slow. Some of those fillas are just too anti and well Bully [contractor] turns a blind eye to all that."* The contractors could also sneer at techniques learnt formally and actively discourage a worker from using them. *"Like he would be on to me to go that bit faster. Never mind you're doing it the right way. He would yell at you to go here or there and you know that's not safe. And he will say to cut the tree here or be cutting when a skidder is under and you can't say no. I mean what's the use of doing a course when the boss is gonna deck you if you do it that way."*

Finally, over and above everything else, production pressure could conflict powerfully with trained skills. This is discussed in more detail in the following chapter on organisation.

Points of discussion

The belief that once learnt, skills would be self maintaining seemed to be held in much of the industry. This was not necessarily articulated but little effort was made by LFITB to build maintenance into the system, nor for training courses and trainers to ensure that it happened. Loggers did appreciate that skills could deteriorate, and bad habits could develop. Some acknowledged ongoing maintenance and assessment would help improve skills. Because

maintenance was not a clearly stated objective of FIRS, there was not always a conscious effort to monitor skill levels. FIRS did not identify who should monitor and maintain beyond the initial training period. It may have been awkward for a supervisor to be continually commenting on skills, particularly when, as was often the case, he or she did not have the level of expertise of many loggers. OSH did not have a system in place to ensure maintenance was carried out either. Even companies gave little attention to either developing real expertise or to maintaining acquired skills. They gave greater focus to ensuring loggers were certificated so that they met the requirements of the HSE. Consequently, the contractor had to take on the responsibility of ongoing maintenance of training.

Contractors had to consider competing influences within their operation. There was often insufficient time to monitor workers' techniques. There was a need to produce wood at a high rate, and if speed required abandoning learned skills, it was difficult for the contractor to insist on them. The peer pressure which brought denigration of cautious methods was unlikely to survive long if a contractor insisted on his workers sticking to the FIRS standards. But as often as not the contractor fostered the culture which created that peer pressure. When the contractor gave little or no credence to the FIRS standards, even if the skills had been taught he was unlikely to try to develop a crew culture which supported formal training and thus the maintenance of safety skills.

It appeared that those contractors who understood the need for maintenance of training had gone through a process where they had become aware of the way that the various elements which comprise the functioning of a crew were interdependent. For these contractors, maintaining safety skills was considered a positive contribution to a well run and productive crew.

General discussion

Loggers' beliefs that many accidents were simply a matter of being in the wrong place at the wrong time, were perhaps derived from their experiences in an unpredictable environment. Training could provide loggers with the skills, knowledge, and safety rules to counteract the effects of unpredictability, thus reducing errors and the need for violation. However, they found that, despite their own skill, or the skill and expertise of others, accidents still happened. This reality gives support to Reason's (1990) belief that most errors come from skill based lapses and rule based mistakes. Most loggers tended to be trained for, or to have learned, only those two

levels. Sometimes when the environment presented an unexpected problem, neither the automatic skill nor the repertoire of rules provided a ready solution. Because few loggers had had time to develop thorough knowledge based skills, they could not respond appropriately. And even if they felt they did have the ability, they said that often there was insufficient time to plan strategies anyway. Difficult environments made training difficult and yet, paradoxically, even more vital for achieving expertise. The more difficult and extreme the blocks, with varied and changing physical conditions, the more complex the training needed to be to cater for the variations, the unpredictability and the more demanding tasks involved.

FIRS was designed to improve production, quality and safety. Unfortunately, a number of factors rendered FIRS less than ideal. Because many loggers did not consider FIRS the best way to learn their perceptions were a major hurdle to the acceptance of formal training. When contractors who promoted training were given some preference in company tendering, acceptance of FIRS was higher. It was important though, to distinguish between those contractors who made token gestures towards the training system and those who took a positive and proactive approach to implementing and maintaining it. Equally important was the difference between those contractors who saw training only as a vehicle to improving production and gaining tenders, and those who genuinely saw it as a device which could make their workers' jobs safer.

The biggest difficulty in determining the efficacy of the LFITB system was the variability of different programmes based on FIRS, and of loggers' experiences within them. Younger loggers, and especially those who had been on a polytech course, valued what they learnt on the courses. However, there were others who felt that the courses had been a waste of time. Johnston et al. (1994) note that there is equivocal evidence at best regarding safety training and given the disparate nature of both the logging industry and the training programmes within it, it is difficult to draw any clear conclusions about FIRS. Fielder's (1996c) finding that there is little difference between trained and untrained fellers and accident levels lends further support to this.

Many loggers suggested they were insufficiently trained for the jobs they were expected to do, or that their training had been poor. This was particularly evident in dangerous tasks such as windblow work. Loggers came across hazards which they were not adequately trained to deal with but often they were required to carry on regardless. It was clear that modern logging, with its high production demands, offered little time for developing such skills. McDermott and Beurger (1991) stress the importance of resources and time to ensure quality training but maintain that

often there are time constraints, inadequate facilities and production pressure which prevent adequate training and follow-up.

The focus of this thesis became the role of the contractor in responding to the dynamics of the industry and implementing procedures within the crew which affected safety both directly and indirectly. A training programme per se is an antecedent stimulus and as such has less effect on changing behaviour than does a consequence. Consequences associated with training are those which are provided when the learning is taking place and then regularly after the behaviours and knowledge which have been learned are performed (Komaki, 1998). Consequences are important in any permanent behaviour change. For instance Komaki et al., (1980) implemented a programme of safety training which produced only limited effect until ongoing feedback was provided. They concluded that feedback is vital for training success. In a logging crew the critical provider of consequences was the contractor.

However, it is important to appreciate that the contractor did not operate in a laboratory. The volatile workplace environment impacted on his interactions with the crew, and affected the level of crew co-operation. Weidner et al (1998) maintain that co-operation between workers, trainers and managers is of particular importance in developing training and assessment. The relations he developed, both with his workers and with personnel who interacted with the crew, contributed to the overall milieu in which training took place. As Dedobbeleer and German (1987) have pointed out, factors such as motivation and attitudes contribute to training effectiveness and in logging crews this is at least partly dependent on the crew culture and the contractor. As a basis for positive crew interaction, a smooth running operation is important. Thus organisation will be discussed in the next chapter to provide a basis for the final results chapter where the relationships between workers and contractors will be discussed.

The building blocks of theory emerging from the data:

Training in logging:

- 1) FIRS is not generally accepted by loggers as sufficiently comprehensive because its intentions are misunderstood.
- 2) FIRS is also rejected because it conflicts with loggers' self image, with some crews' cultures, and with production.

- 3) Those loggers who gain a good understanding of FIRS appreciate that when correctly implemented it can provide a good basis for learning providing training does not cease when modules are passed.
- 4) Training in the bush on the whole is spasmodic and lacks good follow-up and maintenance
- 5) There is cynicism about training because many believe its implementation has been driven by the companies wanting to avoid prosecution.
- 6) Much of the problem with formal training revolves around insufficient leeway to allow time to be taken to implement training properly.
- 7) Costs and the issue of who should pay hinder training.
- 8) Because crews operate in an isolated environment, ultimately the contractor has a very important influence in how well the training is implemented and also whether it is maintained
- 9) As the economic climate has worsened so the emphasis on training has worsened.

Chapter Nine

Organisation

Research has shown that the organisational environment in which work relations take place strongly affects behaviour (e.g. Bryman, Stephens & Campo, 1996). The work systems, individual tasks, and the 'hardware' which a contractor develops provide a platform for behaviour and may have an indirect but important effect on safety (Bernhardt, Hoyos & Hauke, 1984). Gun and Ryan (1994) found that the "provision of safe industrial machinery, safe processes and a satisfactory work environment" (p. 11) was more important for industry safety than was operator training. Tuominen and Saari (1981) also maintained that organisation and systems often affect safety just as profoundly as providing consequences for behaviour. Workers' perceptions of management safety practices have been found to have particular importance for safety in construction sites. These practices are influenced by the level and type of organisation (Dedobbeleer & Beland, 1987). Successful organisation of a logging crew depended on the contractor and his ability to manage the crew efficiently.

In leading a crew, part of a contractor's role was to shape the organisational environment so that crews worked well together and safe behaviour was facilitated. The environment in which activity takes place affects the quality of leadership (Steers, Porter, & Bigley, 1996). The physical environment includes the organisational structure. The leader not only works within the environment, but also shapes it. This is a dynamic process. This chapter discusses four axial codes under the selective code **organisation**. They are: **machinery and personal protective equipment**, **contract issues**, **production pressure**, and **planning and communication**.

Machinery and personal protective equipment

This section covers the 'hardware' of a logging operation. The ownership, use, maintenance, and replacement of hardware rested mainly with the contractor, albeit with a little company influence. The hardware can be divided into the large machines such as skidders and loaders, and the smaller gear such as chainsaws, boots and ear muffs.

- *Large machines*
- *Tools and personal protective equipment*
- *Maintenance*

Large machines

Large machines determined the type of operation a contractor had, the geography the crew could operate in, and the sort of trees they could extract. At one time, any tractor or bulldozer might have been used for a variety of work. Nowadays there is more specialised equipment. Contractors with the big companies often had very specialised machines, which enabled the crew to harvest particular types of forest blocks.

In woodlots there was more 'making do' with what was available, affordable, and flexible. *"He had a skidder, and it wasn't big enough for those trees, and it was under the wire and the chains itself, and they weren't big enough, and so they were under tension all the time, and it was real bad. Pressure, and you gotta have the right equipment. Because if you got heavy leaners and that - you gotta have a good vehicle to pull them over - can't be under weight - just gotta have the right gear."*

The diversity of woodlots meant smaller and less capable machines could be over-extended and used in jobs for which they were unsuitable. Machinery could wear out quickly and become dangerous. *"Well, see, it's steep in the gullies and stuff. The trees were quite big, and we had a skidder that couldn't pull it easy. The tracks, like there's not enough power in a small machine, so it wouldn't be able to pull out of some places, so you'd have to take it down and around the bottom, where you could try to get them out that way. Like, that meant even going too close to a roll-over, you know. You needed bigger machines or a big bully or something. I guess you get used to it, and, see, nobody flipped the skidder, though a few come close a couple of times. But after a while you get on with it. Hope for the best. Or, well, even you don't think about it all the time. Your mind's on getting that friggin log outta there."*

Despite being in a dangerous industry, loggers did not feel constantly in danger. The immediate needs of completing the task overrode the 'remote' possibility that there might be an accident. In crews where the contractor encouraged positive attitudes to safety, loggers were more aware of risk, but where inadequate machinery was being used it was unlikely that the contractor would draw attention to any risks.

Inappropriate use of machinery was less acceptable to the companies, but risks with machines were still taken sometimes, and regulations were ignored. Loggers reported that when

demand for loggers was high, such as after a windblow, some companies bought logs off crews, regardless of the adequacy and safety levels of crew machinery.

When the market tightened up, marginal operations tended to drift to the fringes of the industry. The crew maintained machinery with ingenuity. Often machines would have been judged to be in contravention of the HSE if the bush inspector had seen them. Two operations used old army trucks from the Vietnam War as transporters. Each was held together with bits of wire, unsuitable bolts, plates of steel, and boards. Body panels were bent and rusted, and one had faulty brakes. Parts were very difficult to obtain. Makeshift maintenance made for breakdowns, delays and inefficiency. Such crews found it harder to get work through forestry consultants or companies, and, instead, they worked for farmers or private owners of small blocks, many of whom were less aware of the need for safe practices. Lack of steady work made such crews less economic. Of the six marginal crews visited in the Far North in early 1996, four had gone out of business six months later. In each of these four crews, machinery was makeshift. The contractor who seemed most likely to survive was upgrading his machinery, hoping to win a company contract.

Many of the better crews in the industry had upgraded machinery, buying haulers for steep and wet terrain, and mechanised harvesters for the less steep terrain. The latter cost as much as a million dollars each, but could replace six fellers, thus reducing wage bills, ACC levies, staff facilities, and the risk of injury.

Some contractors found that their systems were not good enough to make maximum use of the sophisticated machinery they purchased. Consequently their operations remained marginal, or less viable. Sometimes, the contractor blamed the workers. " *[My boss] 'Joe [another contractor] is doing over three hundred stems[trees] a day down the road. Our Warratah[mechanised harvester] driver isn't doing that - why not?' But... I'm saying to Jim 'Look, anyone with half a brain can see why he's not producing that sort of wood, look at the hilly country.' I mean, I can't even get to where he is in the skidder. He should have thought of that before he bought the fuckin' thing [mechanical harvester]. And the man's new at driving, what do you expect? And then Jim goes off his scone, ranting and raving about useless workers, and how we'll have to work an extra hour a day to make up and all this bullshit.*" In direct contrast, I observed operations where Warratahs (mechanised harvesters) were being used efficiently. There, the logs were being felled at an impressive

rate, and there were no hold ups. The crew on the skid could barely keep up with the flow of logs.

By mid 1998, several contractors in company forests who had purchased mechanised harvesters were struggling or had gone out of business. This was partly as a result of the reduction in tender prices, and reduced numbers of crews required by the companies. But it also reflected inefficient organisation in those crews. Some contractors could not keep up with the growing competition.

Tools and Personal Protective Equipment (PPE)

There was a marked difference in the quality of small gear used. In some crews workers wore chaps (protective chainsaw trousers) which were in shreds. Generally, workers bought their own chaps, boots, hard hats and ear muffs. Some contractors claimed workers looked after their gear if they had to buy it themselves. But workers who supplied their own gear did not always find it a good system. *"No, we provide the saws and...we buy chaps and wedges and your hammer you know. But I don't think there's any friggin allowance [for tools etc.]. Really, he just expects you to turn up with your gear. If you aint got it, you sit on the truck and not get paid. Sometimes you can borrow off your mate, but you can stuff up a saw and then you're buggered. Sometimes I have to borrow Dad's old saw, but like, up here they wear out real quick in the mud and shit. Break the case. Or the bar - you can bend that easy enough. He says, 'You buy the gear, and you will look after it properly,' but that's not so easy in a job like this."*

Many fringe loggers prided themselves on being able to make do. *"My brother pushed too soon on the tractor...it bent the [chainsaw] blade right around, completely around...and I...thought, 'Well that's the end of that - have to go and get another bar.'...anyway, on the end of the tail gate of the Landrover we use for sharpening, is a six-inch vice, so me and my brother took a bit of a look at the bar and we got it in the vice and, we got the big sledge hammer, and we took to it, and we got the thing straightened right out just about perfectly straight, and I'm still using it now."* While this sort of approach was admired by some, it meant that substandard equipment was being used. A saw with a poor bar can easily lose its chain, which can flick up and cut its user.

Company supervisors usually ensured reasonable levels of gear maintenance. In the poorer woodlot crews there appeared to be greater tolerance for inadequate gear. It was not uncommon to see workers without ear muffs using saws, without hard hats felling trees, without chaps trimming logs and so on. This reflects Klen and Kettunen's (1982) findings in Finland where woodlot loggers used less PPE and had more accidents than mainstream crews.

Some contractors and older loggers claimed that safety gear could be dangerous, a perception which may have some validity, given Dunbar's (1993) assertion that "optimal selection of PPE creates ergonomic difficulties for the responder. These include increased physical load, restricted range of visual field, restricted mobility and psycho-physiological arousal" (p.366). But the antipathy towards PPE also seemed to come via the belief that a 'real bushman' did not need safety gear. The cost of the gear itself and the belief that it impeded production influenced the emphasis the contractor placed on PPE, especially in marginal operations.

Company policy sometimes created awareness of the value of PPE. *"We had to do all the stuff like audits and... I spose I gotta eat my words on the gear and stuff in a way, because it didn't really affect the way the guys worked really, like, I thought they would be slowed down, but it was all right, and nobody was doing anything stupid the way some of these trainees can. It did make them more conscious about safety, I think."* Awareness also came less directly through processes like training. Those contractors least exposed to such influences were the ones least likely to shed the ways of the past and to use PPE.

In the early stages following the HSE, company contractors were generally amenable to the use of safety equipment. As profit margins reduced, the contractor found it necessary to ignore regulations because of costs. In struggling crews, safety gear was sometimes considered dispensable. Ahlgren, Jarl and Oja (1983) suggest that although ideally good workplace systems give the best assurance of safety, sometimes the only way to reduce danger is to improve PPE. If a contractor cannot do this, then some accidents are inevitable.

Maintenance

Contractors who maintained their equipment well were usually highly regarded by their workers. *"Like, Murray is the best contractor around. Everyone says that. And, see, he's always onto it with everything. You can just see it in the way he looks after everything. The*

saws, and the loader and skidder and that. You can read how good a crew is by the gear. And you can read how good the boss is by it, see, Murray has that reputation, and you turn up at the gang and you see it straight away." Maintenance of machinery and equipment was more important than the gear itself.

There was generally reasonable maintenance in most mainstream crews, but in marginal crews where making do was an art, using poorly serviced equipment was common. My observations suggested that in certain crews maintenance was unsystematic and irregular. For example, one crew with a broken hydraulic hose on a loader continually topped up the oil, instead of fixing the hose itself.

Those contractors who continued to upgrade machinery and equipment kept a strict maintenance regime on all gear. They were generally the first to buy the more sophisticated gear and train their workers how to use and look after it. Their workers took pride in operating good, well maintained equipment. They implemented systems to suit their machinery, and as they continued to prosper (relative to other contractors, at least) were able to obtain the better contracts in areas that did not overextend their gear. These contractors could afford new equipment such as mechanical harvesters. They were thus less likely to get frustrated, stressed, and to have to take risks. Workers reported that those contractors who were most stressed and ill-tempered were almost invariably those with machinery problems.

Points of discussion

There was a clear difference between what large machinery and smaller gear represented in terms of safety. Large machines determined what kind of operation a contractor ran, and its maintenance indicated the degree to which a crew was organised and economically viable. Use of inadequate or badly maintained equipment often involved risk. Yet contractors struggling to cope with maintenance and upgrading often found themselves operating in conditions which increased not only the level of risk, but also the deterioration of machinery. Thus, using old and ill-maintained machinery placed a contractor at a disadvantage in the tendering process, and losing out on the better tenders, they found it less and less likely that they could afford new machinery. Because new machines were less likely to break down and cause delays in production, there was also less frustration and less risk.

Evidence is emerging that New Zealand logging machinery is being driven harder, and poor maintenance may be shortening its life considerably (V. McLean, 1998). Many contractors who had gone bankrupt in recent years suggested that with costs increasing and profits reducing, machinery could be critical to a crew's survival (Jayne, 1998). In the most poorly run crews there was no overall management system to ensure machinery was kept in safe operating condition. With insufficient bush inspectors, there was often no policing of machinery and PPE, especially in woodlots. Equipment safety was thus largely up to the contractor.

In using inadequate machinery, workers were accepting that some risk was inevitable. Workers reported working under these conditions because they needed the job, particularly if it was accepted behaviour in their crew. However, some of the loggers interviewed did not consider the machinery unsuitable. As already noted, people who are used to using poorly maintained machinery all their lives may not realise the potential danger. There is thus a mix of deliberate risk taking, acquiescence, and the perception that there are no risks at all.

Some contractors saw mechanisation as a panacea for all safety problems. However, despite the major advances made in equipment design, Bell (1998) claims that injury rates have plateaued and may not fall much further, even with new technology. Laflamme (1993) suggests this may be partly because new risks appear after the introduction of technological change. For instance, mechanical harvesters are purchased in part because they rid logging of the most dangerous job of all, manual felling. In August 1999, a man was killed while doing maintenance work on, the jaws of a mechanical harvester in Kaingaroa Forest (M. Fielder, 23rd August 1999, personal communication).

House (1988) suggests that expertise gives a person the power to lead effectively. Contractors with the ability to develop systems which utilise their machinery appropriately had an advantage in contractorship. Additionally, the ability to plan for optimum use of that hardware indicated a level of expertise which was important for success in such a dynamic industry. Such expertise varied amongst the contractors interviewed, and the differences appeared to grow through ongoing industry changes.

The use of personal protective equipment (PPE) was more indicative of a stance on regulations and safety procedures. In crews where PPE was poor or lacking there tended to

be a negative safety climate. The contractor may not have been organised enough to insist on use of PPE and other safety equipment, but as often he was scornful of such gear.

While there was some tokenism in company crews, they had more positive attitudes to maintenance of gear and use of safety equipment. Since company crews had a better safety record, enforced safety may have had some impact on accident levels. The extent to which contractors ensured appropriate use of safe gear and maintenance of machinery was partly dictated by how profitable their operation was. Yet attitudes to 'hardware' impacted on a crew's success in the tendering process, thus entrenching the existing situation.

The contrast between the 'do it yourself' approach and the more modern approach exemplified the evolution of logging and the struggle between the old and new cultures. This struggle occurs in similar jobs, such as construction (Dedobbeleer & Beland, 1987). *Laissez faire* contractors took advantage of the workers' tendency towards bravado and the 'Kiwi culture' which lionises a 'make do' approach. In the struggle between the two extremes of crew culture, contractors who placed importance on efficiency and safety attempted to change workers' attitudes to the gear. The higher the contractor's standards and expectations of safe equipment, the more this permeated through to other aspects of safety culture. Thus the quality and condition of tools and PPE were indicators of the crew safety culture in which the contractor had a crucial role. He was influenced not only by his personal stance on safety, but also by the need to survive in a difficult economic environment.

Contractors had to anticipate and understand the changes occurring in the industry to survive, and they had to obtain machinery to suit new situations. They needed to foster good attitudes towards care of machinery and equipment, and to design systems which best suited the machinery. In ensuring the machinery was of good quality and in good repair, they avoided frustration and cynicism amongst employees and increased pride in the operation. The overlap of organisational competence and good relations within the crew was thus almost inevitable. The provision of machinery set the basis for crew culture. Whether contractors wittingly approached the question of machinery/equipment with crew relations in mind is doubtful. But it could be suggested that the general attitude a contractor had to that part of his operation was an integral part of overall contractor skills and the contractorship process.

Contract issues

Good strategies for extracting logs were important for an operation's viability. In most organisations there is a chain of command, whereby small groups rely on the organisation to facilitate certain activities. However, in New Zealand logging there was considerable variation in how much assistance crews got. When it was available, assistance came from the companies. An awareness of company contributions in the logging process helps in understanding the difference between woodlot and company crews.

- *Outside input*
- *Company demands*
- *Insecurity of contracts*

Outside input

Independent woodlot crews needed to deal with all aspects of logging. This included acquiring blocks to log, assessing the blocks, co-ordinating with buyers, putting in skid sites and tracks, felling trees, pulling them to the skid, ensuring the logs were cut to correct specifications, ensuring the logs were sorted into appropriate loads, loading the trucks, and often organising trucking. In the case of company crews a lot of this was taken care of. Blocks were allocated by the company, so that the contractor was not constantly having to seek work. Companies tended to offer work which best suited the contractor. They helped contractors assess the best way of logging the block. The company usually provided and operated machinery to put in tracks and skid sites. They arranged trucking. They co-ordinated payments. They also provided economies of scale which helped reduce costs. These company services were envied by many woodlot contractors. *"Yeah, well, the companies make it that much easier see. Like Matt's got that whole organisation behind him, you know. He can whistle up a bully to shift stuff or put in a track - just like that. If Dan suddenly wants something done, we have to try and get a guy to come down, and you mightn't be able to get one for a couple of days. Then it's likely to rain or that. Like even the logging trucks; it's a bloody hassle trying to get them to be in for loading before the skid gets too full of logs."*

Companies also helped with advice about documentation and developing strategies. This was particularly helpful to company contractors, but, even so, many contractors struggled with the administrative side of running a crew. There was resentment about the increasing demands for paper work, even when there was help from the company. *You know, they have you in there doing their systems, writing their paper - 'Fill out the form and do it in triplicate.'*

Forms for training and safety and all your bits and bobs. Your average contractor is up half the night doing the tax forms and the policies and stuff. Shit, you get to work shagged out, and then you gotta put in a ten hour day in the shit and mud. No wonder there's accidents."

Company demands

The best organised company contractors with the most positive attitudes towards training and safety seemed to get preference in the tendering process. Contractors talked about changes in the organisational culture of logging in company forests. *"There's been a lot of changes since then - some for the better and some for the worse, but, basically, [in the past] as long as you went to work and done your job, you kept your job, and a lot of the safety issues that are adhered to now went by the wayside in the past, and... It's so much better that they've been changed. When these things first come in, we really rebelled against them - mostly, like, I guess any person that's reasonably good at their job or competent at a thing won't change for the sake of change - till it's proven that there's a better way or a safer way - you have to go with the times - keep up with the play, or otherwise, you go by the wayside and end up financially and health-wise losing out."* This contractor could see the link between organisational change and safety, and also acknowledged that aversion to change did exist.

Until mid 1996 many company contractors had seemed positive about the changes. Companies promised priority to the most efficient contractors with the best qualified crews. Some woodlot crews attempted to meet the criteria, in the expectation that it would guarantee them work with the company. *"I want to get my National Certificate, because that's what they say you need to be a contractor in their bush. There's quite a few with that in the companies... I also gotta get onto these policies and get that up to scratch. They like to have planning and plotting and all this drama which you would never do in the sort of blocks we do, so I'll have to get up to speed on that, even. It's not a matter of being keen - it's a matter of survival."*

But a growing sense of being manipulated by the company, and of losing control as changes were forced upon them, was common among many contractors interviewed in late 1997. They claimed company changes, ostensibly for mutual advantage, were really to make contractors compete amongst themselves. *"They've just started to change our payment system... no consultation, no negotiation about what's happening. We've been told, '... This is how it's gonna be - take it or leave it.' ... Like, the companies come up and said, 'We're*

getting sick of owning our own workforce - we'll get out of it and get these individual things running and use the rule and divide system... That's always been the threat that's put over us... We have to go faster and faster at work to get the same money ... Everything seems to be moving that quickly that it's hard to keep up with."

The more astute contractors managed, and, in doing most of the administration themselves, developed new notions of running a crew. They reported becoming more reflective and innovative. *"I have to do it, but luckily my wife helped, and we work together, and we've got a computer and that, which helps ... Like, if you don't keep on top of all the administration now, you're history. And I'm not sure that it's really necessary like ... it has got good points, and I spose everyone is in the same boat, so we've all got to do it... Some people leave it all to someone else - pay for it, like give it to an accountant or a consultant ... but, to me, I'd rather do it myself, because you've got more control over it. You get your input into it, and you know really what's going on. You think up new ideas, and new systems and that - In a way it helps to have it written down there. Sometimes you surprise yourself."* Here is an interesting mixture of frustration and pride. It exemplifies the stance of those contractors who had succeeded but had a sense that they had lost something in the process. They had become part businessman, once anathema to them.

Demands from the companies continued, even when prices were very low, and contractors felt that no more improvements could be made. In late 1998 the two largest companies changed the contracting system so that instead of individual contractors, a key supplier (super contractor) was employed (V. McLean, 1998). In the process, the tender prices were reduced even more, despite the key supplier having to take on increased administration, supervision, and training. Many crews were laid off. *"I felt for my boys [workers]. I had always insisted that we were a top crew, and while we stayed that way we would have a job. But when the tenders for key supplier were called for and the successful price was more than a dollar a ton below what I'd stuck in, I was shocked. I mean, I have always thought I ran a really efficient operation and my price was as low as I could move. But, shit, a dollar a ton! Those guys [who were successful in the tender process] are gonna have to cut costs to hell and gone... I mean, there won't be any training, and they'll have to produce huge amounts to stay afloat. ... There'll have to be shortcuts. I mean I would have had to flog my boys to get that sort of production ... they were gob smacked. But it's the way things are going - the dollar is king, and screw loyalty."*

Companies re-structured their contracts so that the insecurity once felt largely by woodlot crews now extended to many company crews.

Insecurity of contracts.

Company crews used to be given alternative work such as pruning, thinning, or road clearance, to tide them over if demand for logs fell. *"The company they are working for should be finding alternative work for them - like Forest Products and CHH in the old days ...and if you're going under, they send out someone to see why you're going under ...One thing down there, if we were gonna be laid off because of over-production in the mill, and the contractor you're working for isn't gonna work for a fortnight, he'll find an alternative for you with the company...or for the gang, rather than see you go off work for that time."*

Loggers said company commitment to its crews had declined. By the time of the last of the interviews, there was concern that long term contracts were no longer secure. *"They've given me a four year contract, but I spose a contract is as good as toilet paper really... Like, you're not allowed to leave rubbish on the site, so they could say 'That's rubbish, that cigarette paper,' and you would be out sort of like that, which is not like the old days... there is a big gulf developing between the companies and the contractors...It's sad."*

By 1998 insecurity was so great that some contractors were putting in tenders considered too low to be profitable. One contractor admitted he occasionally put in such tenders, to make sure he retained his place with the company.

Points of discussion

Though companies placed pressure on contractors to meet their expectations for systems and organisation, they did offer some assistance in the form of machinery and administration. This gave company crews impetus towards greater efficiency.

It was assumed that documentation of policies and procedures would lead to an improvement in crew functioning and safety. This was not necessarily the case. If there were negative attitudes to such policies and procedures and their implementation, they could be ineffectual. Nevertheless, certain contractors thrived on this type of organisation. It improved the running of their operations and gave them leeway to develop safety systems. Ironically, the contractors

who ran the most efficient operations were working for companies and receiving assistance, thus giving them a continued advantage over the woodlot crews.

Becoming familiar with computers, faxes, policy statements, training records and so on was difficult for many contractors, and some left it up to consultants, accountants, and advisors. C. McLean (1998) notes a significant increase in consultants and advisors in the industry, as a response to the growing need for written material.

On the other hand, unwilling to meet the stringent demands of regulations and documentation, some fringe operators avoided new systems altogether and became almost 'underground', operations. They were driven away from mainstream industry influences which might have moderated the riskiness of their operations. With the likelihood that smaller forest blocks will take an increasingly important role in logging in the future, there are serious implications for safety. Additionally, in going 'underground' the contractor is likely to suppress accident reporting even more than is presently the case.

Although some contractors found that in learning the new systems they were able to improve efficiency, even they found themselves stretched in the end, when production pressure continued to increase. Beyond this point, even careful contractors may begin to take risks.

Contractors' perceptions that the new systems were not for their benefit, after all, led to resentment and frustration. This impacted on crew relations and their sense of loyalty to the companies and the industry. The lessened sense of loyalty and the belief that the companies were exploiting them were likely to reduce positive co-operation and also reduced commitment to safety and training.

Production pressure

A large proportion of loggers identified production pressure as a critical factor in accidents, supporting Quinlan and Bohle's (1991) contention that safety programmes may be compromised by excessive production pressure. *"Like, there are crews out there do twice what they used to do, even three times, and getting half what they were three years before... They [the companies] realise it, all right ... if you have one hectare of trees and they're gonna pay you so much to do that lot of trees, and you know to do those trees should take you say three days... [using] safety gear which might slow you down - so you don't use*

it ... that final ten minutes of each hour is your profit, then you can't afford to use some of the safety gear... the only way you can do it is you're not using gear - [the companies] dictate that, and that flies in the face of safety ... a lot of guys have the safety gear there in case the supervisor or bush inspector comes along, but they don't use it, and they go like hell for leather." Such a description incorporates many of the factors contributing to risks in logging: high targets, not using safety gear, companies knowingly demanding dangerous work rates, low prices, tiredness, and pressure from the contractor.

- *Declining market*
- *Weather and terrain*
- *Inefficiency*
- *Pressure and risk*

Declining market

In the early and mid 1990s, demand for logging crews was high but then it fell, reaching very low levels in 1998. The downturn in logging created competition among crews. This was most pronounced in the big company forests, as the number of tenders fell dramatically. *"Once upon a time if you were a good reliable contractor... they just rolled you over, but all of a sudden they decided that that wasn't as cost efficient, so they made this threat, to say we had to tender for the jobs and if you don't get the price down to where they wanted it, someone else would. That's started about three years ago... Like, they can break the contract if the demand's not there for the wood. They just ring you up and say, 'We don't need you.' ... there were twenty contractors ... and the six that they were going to sack were told ... they had to be out of the bush by the end of that day."* By the end of 1998, nearly 50% of crews had been laid off in the big company forests (G. Steele, 26th February, 1999, personal communication). One contractor who advocated against the lay offs in 1997 claimed his contract was terminated despite having worked for his company for more than twenty years, and despite having just reinvested in new machinery. He was convinced that this was because he tried to organise the Contractors Association into a pressure group.

The weather and terrain

When low prices combined with difficult weather conditions, pressure to take risks in order to maintain production targets was considerable. Some believed no contractor could remain efficient in the very worst environments: *"And, see, the guys who are forever struggling on the rumpy country get stuck there, and it can be hard to turn a rotten apple into a golden*

egg." But others maintained that a crew could still operate at acceptable levels, if the contractor had the organisational ability. *"Like, overall, everything is more organised from the moment you get picked up till you get dropped off, so I don't think being on the sand or being in the steep clay country has much to do with organisation.... See, Don is going to be organised anywhere he goes. He's just that sort of man, and so if you went into somewhere like Haumanga, Don would still be fine, but, of course, that's not to say it wouldn't be tough."* There is little disagreement that difficult terrain and weather made for greater danger. Those contractors who battled the weather and terrain almost inevitably had problems. However, many felt that safety in such circumstances depended partly on how much the contractor expected his crew to ignore caution.

Inefficiency

A contractor, who employed several sub-contractors, suggested that poor management skills created production pressure. *"They're often under a lot of financial pressure, I guess... The way they [companies] get guys to commit their own capital to big projects that come up, and the guys go and borrow the money and buy the gear, and then they start work, then [the companies] literally screw them. I've seen it in several crews I've worked in - the boss just doesn't have those skills to keep the crew running smoothly. And any skills go out the back door when the pressure's on... they can't produce good systems which would mean less frustration... a lot of them are not very organised... A lot of them are ill equipped for leadership. They just don't have any man handling skills, and they get a reputation as being not very good guys to work for."*

While it was acknowledged that all contractors suffered pressure, it was perceived that some were better suited to being contractors than others. Even when prices were reasonable, some operations were under pressure to work unsafely because of breakdowns, poor planning, and poor worker relations. *"He should have comfortably produced four loads a day, but he was trying for five loads a day, but that extra load-and-a-half a day was costing him... he was breaking gear, and running over chainsaws... he was just rip, shit and bust ... he burnt out his skidder... he never cleaned, it or anything like that ...and he left the hand brake on - when he took off, and it heated everything up, and it caught fire... it made it dangerous too, working on his skid, the truck drivers hated going there. You never felt safe when you were around him ...he used to ...sit [the workers] down and scream and yell before they went back to work."* Such contractors usually found themselves in difficult blocks, where the

situation exacerbated their problems and caused greater pressure. The physical environment was even less conducive to making a profit, and the vicious cycle continued.

Pressure and risk

Contractors were usually unwilling to admit that production pressure was creating risk. Generally, they suggested that things were very tight and any further pressure would make the operation unsafe. However, reducing their tender price while costs of machinery, fuel, and wages remained at a given level meant the only way to keep a profit margin was by driving machinery and workers harder. *"If the companies are gonna cut costs and in the same breath cut down the money a contractor gets, they're [contractors]gonna cheat[take risks]. It's only human nature, and they're [company bosses] sitting there in their ivory towers laughing, looking down on you contractors as if you're a second rate citizen. ... The poor fuckin' contractor thinks 'I can't move. I'm gonna get squashed here' ... Who's at the end of the chain? The poor old monkey on the end of the chainsaw."* There was an acknowledgement that, ultimately, the workers did suffer.

On the whole, workers saw little choice but to go along with the situation, although they realised some crews were more dangerous than others. *"One particular guy ... just put too much pressure on the guys, and in the finish the whole gang, just all of us left in the finish, because - and we also had - like, we were the highest production crew in Tasman and we also had the highest accident rate."* But workers were more likely to recall having continued in dangerous jobs, because they felt they could not rebel.

Points of discussion

It was clear that the physical environment did have an impact on logging operations. It represented an added hindrance to meeting production targets. Loggers made some allowances for weather and terrain when tendering for a block, but when prices were very competitive they had less leeway. When bad weather was combined with steep terrain, it slowed down or stopped the operation. It was then that pressure to take risks increased, and machinery and workers had to be pushed beyond safe levels. Planning was more difficult in those circumstances. In the past, in places like the Forest Service, when it rained there was a far greater likelihood that the operation would stop, because targets were more flexible. More recently, in both company and woodlot crews, margins were such that work had to continue.

With a declining demand for logs there was a surplus of crews and, consequently, increased competition. With lack of organisation, pressure mounted and safety could be compromised. Pressure to drive workers to increase production might be one of the few options a contractor had. Production pressure could hinder organisation improvement and reduce the chances some contractors had of succeeding in the tender process. On the other hand those who improved, despite the greater challenge, increased their competitiveness. This process was easier for company crews, as they had the assistance of the company infrastructure.

In occupations where the demand for products falls, or where fewer jobs are available and where the environment is a restricting factor in production, profitability tends to fall. Workers may then be prepared to take greater risks when physical conditions are dangerous (Jensen, 1997).

Planning and communication

Basic logging procedures could carry on with little need for contractor direction. It was only in more difficult terrain, where weather played a role, and machinery requirements became more critical, that planning was vital. Systems had to be worked out for the block, and adapted and altered as the work progressed.

- *Planning each block*
- *Planning ahead*
- *Bookwork*
- *Communication*

Planning each block

Planning in each block was important if a crew was to run smoothly. Anticipation and management allowing for the effects of the physical environment helped maintain profitability. For example, one contractor monitored the changing temperatures. As summer came round and days grew hotter, his crew began work at five o'clock in the morning, finishing by one o'clock. He encouraged his workers to eat nutritious high energy food in breaks and to maintain a high liquid intake. This reduced stress and fatigue. The weather was always unpredictable, but, to a certain extent, it could still be planned for. Some contractors had stand-by areas in a block which allowed them to keep working in the wet. There were differing approaches to planning: *"Well, out there at Hauru there's some real steep pieces, and the trees are pretty shitty, but Gordon [a fellow contractor working in the same block]*

comes in, and he's gonna rip into the best block slap in the middle of summer. It's near Mangataiore, see, and it fair pisses [rains] down there in winter and even earlier. I said, we should save the easy work, cause I been caught out before. I said 'Let's try and knock out [fell] those tricky bits while we can. Do them in the dry.' Gordon says, 'Better to make hay while the sun shines' sort of thing, and I said, 'No way, you gotta weigh it all up, and I want work over the winter.' ... See, some fullas will get a bit of sand work in the winter, but they're few and far between. You can't rely on it. So you work out which are the easy bits, and cut your tracks so when winter comes they're still there, and you aren't cutting the mud up too much, and they aren't too steep for your skidder. Trouble with Gordon, he's rip, shit and bust, and that's what he'll go - bust." The more organised woodlot contractors logged steep blocks in summer and sand blocks in winter.

Planning was easier on well laid out blocks. However, many farm blocks were established on poor, steep land. Planning was critical not only for the profitability but for the safety of the operation. "Normally, farmers planted the mongrel hill that he's got out the back, he's not gonna plant his good paddock. Then he's got a fence right at the bottom, and probably nailed it to the tree. And doesn't want it touched, so the skidder drivers gotta sidle round, powering through the middle of the block, and the trees are often pretty hairy, because they've not been kept tended." Some operations were not suited to the particular blocks, but the contractors took them because they needed the work "A lot of the problems that contractors have had in the past are through doing bad jobs, bad clean-up jobs is a lot of it. Consultants mismatch the contractor to the job. Like, it might have been a bulldozer job, and they've put a skidder crew in, and the poor guy will be struggling, and I think that's where there're a lot of problems." Such poor conditions made planning harder and contractors often hoped for the best, and tried to get through the block as quickly as possible. This could produce unsafe conditions. "And then these fullas are powering into it without too much thought, trees going every which way, trying to get those logs outta there quick as - cause, otherwise, there's no money at the end of the job. Like, Mervin, he had a beauty over near Langford, and he ... knew there was gonna be fuck all money in it, so I reckon he panicked and tried to up his work rate. Which is the worst reaction. Had his boys down to the knuckles working in bloody chaos. Logs flying in all directions. His skidder rolled twice - well, once it actually flipped right over - his driver was pulling too much down a hill and one log caught a stump, stopped the skidder short, and she flipped... that's what happens when you start going hell for leather without thinking about it."

In the better crews both the contractor and the crew combined to solve problems that arose.

"I've got a foreman and if he sees stuff out in the field, it's his job to make sure it's right. If it still doesn't work, that's when we get together and have a yak and sort it out and see what we can sort out, and the boys will chip in their pennies' worth ... The foreman and also Danny are pretty experienced, and you use that knowledge ... And the boys enjoy giving their input, like, it's their jobs on the line."

Not all crews reacted well to the unexpected. *"Jon's not really very well organised, and that not only affects the production of the operation directly, but it affects the morale of the guys. They get pissed off, and I know I used to get pissed off now and then. Trying to do jobs that are hard enough as it was without having to combat sloppy organisation ... if something goes wrong, we usually have to make do. And half the time, if we have a breakdown we just gotta pack up for the day - or the week ... I think the fact that Jon is a bit disorganised has meant he has missed out on some of the better jobs."* Poor planning and indecision could create dissatisfaction amongst the workers.

Planning ahead

More of a problem, in many crews, was the lack of long term planning. A good contractor needed to anticipate changes in the market, in technology and in methods of extraction. One contractor, for instance, anticipated that environmental sensitivity would become an issue in some areas, and was gearing his operation to specialise in this. This entailed reading about similar operations in the U.S. and then obtaining the gear and skills necessary. *"I have come into Wairau to do an environmentally sensitive block. We're capping a hill for a hauler.... I run a grapple skidder, and I've always done rolling to steep... now I'm picking that a lot of blocks, especially near town where people are likely to notice, will attract the attention of the district council. Like there's a lot of new issues about erosion and even visual scars on the land. See this new block, if you look north from town you will see it, and so if some Greenie sees big scars in the hillside, all hell might break loose. So I am trying to develop methods to minimise that. Probably I'll work in with a hauler operation - they'll do the steep stuff, and I'll work the easier stuff, but with an emphasis on as little damage as possible. The company wants this. They're running a bit scared of the Resource Management Act."* Astuteness and forward thinking were important for modern contractors. They required a good understanding not only of the industry, but of associated issues which might impact on

the industry. At the same time, they had to have the ability to develop appropriate strategies to take advantage of the changes.

Planning to ensure there was always sufficient work available was a problem for independent contractors. They had to seek work through consultants, forests block owners and farmers. Because prices were increasingly low, they had to be much more active if they were to obtain contracts. With increased competition came the need to demonstrate that their operations were up to date, and able to meet the needs of the market.

Developments in the industry had increased the demand for improved quality of logs, increased mechanisation and technology, and adherence to environmental regulations. The companies increasingly expected contractors to run more sophisticated crews. On top of this, company contractors were expected to take greater responsibility for total management. In 1998, Ginny Radford, speaking on behalf of Fletcher Forests, reported the company's intentions to the media in Rotorua. "The company was moving to larger contract units and was trying to make contractors more accountable for their operations in the field, as they were in a better position to enforce safety standards... This would mean less hand-holding from the company" (Hewson, 1998, p.2). Few contractors had a background in business management. Those who developed such skills seemed likely to become the key suppliers of the big companies, employing less business minded loggers as sub-contractors.

Bookwork

Loggers tended to call anything written down 'bookwork', though much of it might better be called documentation. This included written tenders, developing extraction and assessment systems, plotting, accounts, tax returns, ACC records, insurance records, wage records, pay slips, log specifications, records of logs extracted, training policies, training records, safety policies, hazard identification reports, and accident reports. Over the years the need to record information had increased greatly.

Some contractors found that improved documentation assisted in the efficiency of their operation. "*See even this bookwork - well, I spose I have to admit that it gives you something to think about. You got your policies and that, and it helps to reflect, as they say, helps to think about what's going on, on the job.*" Contractors claimed that 'having their finger on the pulse' helped in running an efficient crew. When everything was written down, it enabled

them to make better decisions. Often, though, documentation was done only to keep the company supervisor or consultant happy and had no connection with how the crew really operated.

In all crews, the basics had to be done: tax, ACC levies, wages, and accounts. Some woodlot contractors had upgraded their bookwork, hoping to get work with a company. Often, contractors had had little formal education and relied on their wives or an accountant. *"All this bloody bookwork is a bit much for me. I fire it at the wife, and after that I don't want to know about it. It's not my thing, but she does what she can. Gets the accounts and that ready for the accountant, and then he works out GST and ACC and blahdeeblah, but with just me working there's none of this employee shit, which would drive me out completely. I hear some of these contractors, like Charlie up the road has to have a policy for this and a policy for that and books full of training plans and stuff. It's all just a waste of paper. I'm here to cut trees, and that's what I do best."*

Workers judged a contractor partly on how well they perceived he managed documentation. *"My chain flew off, come off the bar and came round and hit my chain catcher, but it still caught my chaps. And straight away Den said, 'Write that in the book, cause then if your leg gets infected, it's in the book, and we know what happened, and there's nothing tricky.' ... And well he will write up the report for ACC and that so it's all kosher... So that's what I mean by organisation - accident reports and things like that... Stan [previous employer] does a lot of things wrong, he doesn't have much of the stuff written down... Like, he said to me, 'What hours do you think you've worked?' ... like, that's what I mean about being organised, like, Den and Lou are really on to it. Your pay slip's there and everything is on it - you know how many hours you worked and all the days you've had off, and the rain days and the half days or whatever."* Some workers became very disgruntled because their wages and accidents were poorly recorded, there were no hazard identification reports, contractors forgot their tallies, and specifications for cutting logs were vague. Often, workers found they got blamed when things went wrong. Thus, documentation not only impacted on the smooth running of a crew but also on relations between crew and contractor. Both could impact on safety.

Communication.

Contractors had to communicate the needs of the operation and inform workers of relevant material from the wider industry. In this context, they communicated the place which safety had within the operation. A contractor could provide incentives and disincentives in relation to individual instances of safety behaviour, but just as important was clearly setting out safety rules.

When there was little communication and workers failed to perform tasks as expected, the contractor could become frustrated and even angry. *"They [the contractors] keep you in the dark, you gotta take your mind reading pills to work every day. They expect you to know what's going on without them telling us. But they don't get brassed off if you don't know... It's only when things go wrong they start jumping up and down."* This indicated to the workers that the contractors were not concerned with whether or not they were well informed, providing the work was done. Contractors seemed to ignore the potential link between lack of communication and a malfunctioning operation. *"Yeah, well, Ross is pretty hard to get to know... And he's pretty quiet at work. He gets on with it. Expects you to know without being told, really. Like, we know what to do I spose. ... Every problem is a bit different, but if you use your brain you'll figure it out. You can't go running to the boss every second if things go wrong. The new ones that start, they usually work it out after a while. So Ross wants a man who will get on the job without having to be told, you know."* Workers in such situations often accepted the reality of minimal communication, and often managed anyway. Minimal communication often included little or nothing being formally said about safety. There was an assumption that a good bushman would carry out a task as safely as he deemed necessary.

At smoko, loggers often discussed how this area or that might be best approached, how such and such ridge was the best one to put a track along. Generally these conversations were restricted to the more experienced crew members. The rest listened and tried to understand what was required. Conversations, nevertheless, could be very unclear to an outsider. A sample of a conversation I noted while sitting in a smoko hut was: *Bill: "Track's in the wrong place." Sam: "Mmm, rain probably Wednesday." Bill: "What about the ridge?" Sam: "Nah, a bit unstable." Bill: "Best stick to the side?" Sam: "Dunno. Could be." Bill: "This block gives me the pricker. That gully's too wet. She needs a good dry out. Might cut a ledge first." Sam: "Could be. Fuckin' weather."* The conversation ended there. It was

unclear whether 'Sam' had approved of moving the track or whether the idea of a ledge appealed. No mention was made about how to ensure the safety of the track.

Some contractors had a brief meeting with the crew each day, and outlined any changes in plan, directed workers to areas, discussed any problems and so on. This could occur again at smoko and after work. Workers usually appreciated that their boss was clear about how things should operate. *"Ron's good, in that he's got no hesitations in coming out and saying things... He's not too overpowering, but you know he's the boss, but that's good, you know where you stand. Like ... 'That's what you gotta do Brent, go and do it, do it like this,' and I'm fine... you gotta do it how he wants it, and there's no worries. Stu [previous boss] would say 'You go down there and just start and do what you think'...and being inexperienced, like, being two years in the bush is inexperienced, as you know, so you wouldn't really know what to do, and you'd have to bungle your way through things."* Ideally changing needs were quickly communicated to the workers. But some bosses hoped the workers would work things out for themselves.

Communication between the workers and the contractor increased awareness of ongoing work patterns. The best contractors could release themselves from a set task and walk around the operation monitoring systems: *"Like, now I don't have a set job at work - it leaves me free to roam around keeping an eye on things, working out new systems, and it gives me the opportunity to keep an eye on how well any of the workers are going, you know, stop and chat, see how they're feeling about the job, what they are having problems with....See, you get insights into the operation, and I guess I'm a better boss for it. Get to know the boys, and they are more relaxed about saying what they think, even when they want to bitch a bit. And so you tend to be able to put things in place more quickly. You're there on the spot, and you can make the adjustments. And move along the chain fine tuning I guess you could say."* Workers who had previously been in operations where the boss either yelled instructions or said nothing at all, appreciated it when the contractor considered them important enough to talk to.

Points of discussion

Contractors fell along a continuum between the laissez faire style leaders who ran reactive, change resistant operations and the proactive style leaders who ran innovative, flexible

operations, responsive to the dynamics of the industry. In the latter operations, planning was an integral part of the process.

In approaching each block, many crews tended to respond to arising contingencies rather than plan appropriate strategies beforehand. Loggers who had spent years at the job were likely to have a reasonable grasp of the basic needs of working a block without deliberately developing a plan. While this approach may have been satisfactory when profit margins were good, it was less successful when the market tightened. Those loggers who had little understanding of the need to become more efficient were less likely to respond positively to change by planning each operation. In failing to meet the new demands, it was difficult for them to maintain a profitable business. As their profits declined, rather than planning to increase efficiency, they tended to become more demanding of workers and more likely to expect risk taking to achieve targets. There was also a greater need to plan well ahead to ensure continual work and to anticipate change. If able to do this, they gained an advantage over those less capable of planning.

Since bookwork was a requirement, contractors who could deal with it efficiently were at an advantage with the companies. More important still was the ability to communicate plans and changes to the workers. Better communication helped gain their co-operation and facilitated successful implementation of strategies. This approach constituted a large change in what is required of a logging contractor and his crew.

General discussion

Over time, mainstream logging has demanded greater levels of structured organisation, with better machinery, better and more efficient extraction methods and better documentation. These improvements have become vital to the survival of logging crews. Need for change has been driven by the evolving expectations of modern business organisations and the changing global market. Globalisation creates rapid change and, consequently, less stability within industry (Komaki, 1998). Such instability appears to have had impacts which have not only affected the organisation of crews but also their safety. Generally, this kind of organisation was in the best company crews. In the tender process the companies selected those crews who were the most organised, cost effective, and were able to incorporate training and safety into their operation. There was very little planned organisation within some crews, particularly in the fringe woodlots.

Loggers were aware that a poorly run crew could produce dangerous operating. Poor systems tend to produce error and breakdown and consequent accidents (Hollywell, 1996; Johnson, 1996). There is less reference in the literature to the fact that the inefficiency of poorly run systems causes frustration. This can have indirect effects on safety, through bosses driving workers too hard, resulting in a breakdown in group cohesion. Much of the safety literature, which views organisation as a critical component in accidents, looks specifically at safety systems and safety equipment (e.g. Brown & Holmes, 1986; Dedobbeleer & Beland, 1991; Zohar, 1980). It does not tend to treat safety as a product of the total operation. Le Plat (1984) recognises that there can be a chain of events leading ultimately to accidents. The present study indicated that, in logging crews, safety was dependent on the way the total system functioned. However, workers tended not to see these indirect connections. They thought in simpler, more immediate terms: whether the boss was skilled or not; whether he could handle machinery or run a good operation. They suggested that incompetent contractors made the operation more dangerous, simply because they were likely to make errors. In extreme situations, systems of extraction were haphazard and the machinery used was inadequate. The environment in which many woodlot crews worked emphasised the effects of poor organisation.

The environment in which logging took place had important effects on levels of risk and danger, supporting Quinlan and Bohle's (1991) finding that the environment is a primary cause of accidents. The bush is by nature variable, and conditions change with the weather. The environment can only be controlled to a limited extent, and it is always difficult to predict changing conditions. Loggers said that difficult physical conditions slowed work down, lowered the comfort level, made work more strenuous, and caused breakdowns and mistakes. In difficult weather and terrain, conditions deteriorated, and with poor gear, activities in a crew could become dangerous. While ergonomic studies and accident prevention projects develop equipment which is designed to reduce risk of accidents (e.g. Gaskin, 1986; Kirk & Parker, 1992; Kirk & Parker, 1993; Sullman, 1998), it is of little value if not used properly. Loggers acknowledged some of the equipment such as chaps and chainbrakes had added to safety. But these were useless when damaged, or not used, as was often the case in crews observed.

Loggers suggested that poor equipment produced error, supporting Hollywell's (1996) findings. However, they also implied that error often came through violation. Ringen et al., (1995) agree that working with poor equipment is likely to elicit violation. Loggers recalled how they were forced to drive machines which were unsuitable or poorly maintained, and to use gear which was broken or make-shift. They claimed that this was what caused them to make mistakes, illustrating the assertion made by Reason et al., (1990) that error and violation may occur together. When they were not differentiated, incorrect assumptions could be made, making prevention measures inappropriately targeted. Difficult conditions were likely to elicit further violations, as suggested by Lawton (1998). Harsh physical conditions led to frustration, because tasks were difficult to complete without breaking safety regulations.

When production pressure was great, the contractors sometimes forced employees to work in dangerous conditions and to take short cuts. Similar findings have been made by Quinlan and Bohle (1991), Pauchant and Mitroff (1992) and Vaughn (1996). In keeping with Gibson's (1994b) study of New Zealand forest workers, the present findings indicated most loggers thought production pressure could make the job more dangerous. Moreover, as with Gibson's findings, it was clear that contractors were less likely than workers to attribute danger to production pressure. However, towards the end of the interviews, as prices fell even further, contractors were talking about the pressure and admitting that it might take a toll on workers' safety.

More efficient production systems did not always mean improved safety in the crews. There was a point beyond which contractors could no longer maintain their focus on safety because of production demands. At that point, not only safety but also crew relations began to deteriorate. It was clear that whether a crew remained efficient, and yet safe, depended partly on the contractor's ability to organise and lead. The contractor's relationships with his crew were important in this regard and will be discussed in the following chapter.

Workers placed importance on the ability of the contractor to organise. A well run crew was likely to be a happier one. It was apparent that some contractors had developed skills, as mounting pressure demanded that they remain efficient to survive. They planned properly, using their skill and expertise. They communicated the plans well to the men. They ensured they were well trained to be able to carry out jobs efficiently. This organisation required more than the skills of the old wage crew foremen or the traditional contractors. Consequently,

contractors had to change their approach to running the crew. This transformation of contractorship indicates an improved level of leadership, both in man management and in organisation.

Theories relating to leadership, particularly more recent ones such as transformational leadership (Bass, 1985), tend to focus on relationships, inspiration and intellectual stimulation, and the leaders' ability to innovate, anticipate, adapt and be flexible (Koh, Steers, & Treborg, 1995). These attributes are said to be required because of the dynamic processes within the industry which demand constant response to change (Sarkus, 1996), such as that engendered by globalisation (Komaki, 1998). In the leadership literature, most of these abilities are connected to relationships. However, it appeared that changes in the logging industry required leadership via the development of improved organisation. While transformational leadership theory suggests that such organisation is a managerial rather than a leader activity (Blyde, 1997), in the logging industry it seemed that the two were inextricably entwined. The findings indicate that organisational ability is a pre-requisite for the transformation of contractors to a more proactive, innovative mode of leadership in their crews. In being proactive and in developing his crew's systems, a contractor may be transforming his operation and himself. It is important to recall that leadership is partly determined by follower attribution (Bresnen, 1995). In logging crews, organisational ability was considered very important by workers, and it encouraged their respect for and commitment to the contractor. This provides a link to the emphasis transformational leadership places on inspiration in leader-follower relations (Bass, 1985).

By monitoring his crew's systems, assessing deficits, and responding proactively to new demands, the contractor maintained or restored stability to his operation. Sarkus (1996) says that transformational leadership has tended to look at transformation in the light of globalisation and culture change, where there is a demand for adaptation and innovation. He suggests that there may need to be a new type of leader who is stable and innovative at the same time. This sort of contractorship style was emerging in some of the crews in the present study.

Building blocks for the theory emerging from the data:

This chapter discussed organisation and the way the contractor, in adapting to the new demands of the changing industry, either developed new and competitive systems which

incorporated acceptable levels of safety, or struggled and often reacted by withdrawing from mainstream logging.

Organisation in logging:

- 1) The changing demands of the market affect the type of organisation required in logging crews.
- 2) When the market is tight, efficiency is vital to the continued survival of company crews, and woodlot crews which remain in the mainstream.
- 3) The improved efficiency often produces better levels of safety awareness and safety behaviour.
- 4) The crews which cannot cope when prices are low are forced to increase pressure on their workers to meet targets.
- 5) Production pressure increases the likelihood of risk.
- 6) If the market continues to contract, and production pressure grows too great, it is difficult for even the most efficient crews to implement systems which can be carried out safely.

Transformation of logging

At a second level, there appears to be a transformation of crews via the development of organisation.

- 1) Contractors who have the ability to understand and respond proactively to change and pressure become increasingly innovative, adaptive, anticipatory and flexible. They remain the most viable operators.
- 2) The standard of organisation increases in mainstream industry and as contractors struggle to retain their place in the hierarchy, more innovation and adaptation is required.
- 3) Those who fail tend to drift to non-mainstream activities where the demands are not so great.
- 4) The gap between the best company crews and those on the fringes widens.

Chapter Ten

Crew relations

The organisation of a logging crew sets the scene for social processes which can lead to accidents. In a logging crew, human interaction is moderated by the environment, the systems and 'hardware' of the crew, and the influences of the world beyond the crew. However, the isolation and relative autonomy of logging crews meant the role of the contractor in crew relations was particularly important.

While some contractors insisted that their number one priority was safety, none of them would continue operating if the crew were non-productive. Thus contractors provided motivation mainly for production. Promotion of safety came partly through a contractor's concern for his workers, but just as likely, from a fear of prosecution. However, some contractors seemed aware of a link between safety, good worker relations, and production. An understanding of the interaction between workers and contractor allows one to appreciate how safety was facilitated via the contingencies provided through crew relations.

The way loggers were motivated to continue logging, to take risks or perform safely, and to work harder, was interwoven with many issues. These included the organisation and training in the crew, and the rules and regulations which affected many aspects of the operation. The importance of these issues was influenced by the emphasis the contractor placed on them. How the contractor related to his employees and encouraged particular behaviour within the crew is discussed in this chapter which presents the selective code **crew relations**. The axial codes in this category are: **financial incentives, symbolic appreciation, verbal appreciation, aversive interaction, and contractor behaviour**.

Financial Incentives

- *Money*
- *Incentives*
- *Allowances and hours*
- *Security of employment*

Money

Many loggers suggested that once they were working within daily routines, expectations for excitement tended to dissipate, as money, fatigue and the physical conditions grew in importance. In the 1970s and 1980s, loggers' pay was good relative to similar jobs. However, loggers claimed that in the last seven years their pay had remained static or even reduced. Meanwhile average pay rates for New Zealand wage workers as a whole had increased (Boxall, 1997).

Some workers in early interviews expressed satisfaction with their pay, but, as the economic situation tightened, this changed. Those re-interviewed expressed greater dissatisfaction. *"Many are probably lucky to get \$600 clear a week for a full eight hours, plus the travel ... I reckon us guys who are working in logging and forestry are worth more than we are getting - it's hard physically, it's very hard and very hazardous, and... all the weather conditions, rain, hot, windy, snow - ... in a factory, a lot of the machines can be guarded ... out there, they have none of that, and that's why it becomes more hazardous."* Workers were more likely to suggest that the job was unsafe and unpleasant when they were unhappy with pay rates.

Sometimes loggers restricted their complaints to the environment but dissatisfaction often extended to other things. *"Chainsaw costs have gone up, they've made us wear spiked boots, high viz and that sort of stuff, and we have to pay for it, but wages haven't gone up... They make you do windblow, and yet they don't pay you for it, and they don't train you for it, and ... they say things like that we have to pull just the same [amount of wood] because the wood's on the ground - even if it's really dangerous, and all the trees are tensioned...our boss ... says 'Ohh, I want you to cut the trees a bit closer to the stump, cause we're losing quite a bit of butt log,'...So now when you got the trainer beside you saying, 'That's not acceptable' the boss goes, 'Ohh, oh I got it wrong, okay boys,' and all this stuff, but when the trainer is not there and you say to the boss, 'I'm not gonna do that,' the boss will say, 'Okay mate, I'll get someone else in here that will - find yourself another job, grab your gear and fuck off.'"* Dissatisfaction with pay could affect more general perceptions of the job. Where loggers were content with pay rates, they generally felt less aggrieved about taking risks or working under pressure.

Research has found that piece rates can lead to an increase in accidents (Hopkins, 1984; Hopkins, 1994; Quinlan & Bohle, 1991). Only five crews included in the interview process

were on piece rates. Where these were based on production for the week, averaged out for each worker, there was antagonism. *"We were cutting 12, 14 ton a day and there were fullas up there only doing 5 ton a day and all our work was getting mixed in with theirs. ... so we all kicked a up a stink - cause those fullas started getting lazy to only cut 5 ton a day and still get the same as us, which no way we were gonna put up with that from those lazy bastards... fullas were nearly breaking their backs when they were lifting too much - they were going down like flies, and OSH had to step in. We had to work too fast to get the good money"*. Rather than seeing such a problem as a flaw in the system they directed their sense of frustration at fellow workers. Dwyer (1991) notes that many studies suggest group cohesion affects safety. Most contractors found that piece rates created unproductive friction within the crew.

Satisfaction with monetary reward and safety were usually linked. Sometimes the worker was aware of this connection but took a calculated risk because of the money. *"I've worked for a guy for three and a half years, and we went through 56 men in one year, and he was a real bastard - a mongrel, but he paid probably the top wages I have ever had ... he was a real hard man...he would push you so much it was plain dangerous at times, and I know a few of the guys had accidents at one time or the other."*

Most contractors felt pushed by the companies or log buyers to increase production and reduce tender prices. One way to improve margins was by achieving greater production for the same labour costs. *"It's definitely a lot more stressful with the low profit margins, because, as one of our supervisors is so fond of saying, 'You gotta sharpen your pencil - for appraisal' but you can only sharpen it to a certain amount - you can't push the men any harder - I mean, you gotta think of your safety ... you can pay more money - but then in doing that, at the end of the day it's still gotta be costed out."* In effect, safety had to be sacrificed for increased production. Such a situation had serious ramifications for crew relations.

Incentives

Contractors offered incentives like beer, fishing trips, and Christmas parties. Some loggers built this into their idea of payment for the job. *"He is very appreciative of what his men do for him. ... Easter Eggs for all the kids of the men, and he doesn't spare any horses at the end of the year wind up - he goes all out, good do, very good. When the women come in,*

they get flowers to pin on their things. A good Christmas do every year, every year. But these other guys here don't. They don't have nothing, not even to say thank you for the year, and this year we would have been close to pulling seventy thousand tons or more, I don't know what that comes out to in dollars and cents, but it would come to four million dollars or more." OSH viewed such incentives as bribes which enticed loggers to work not only for less money but often dangerously (M. Fielder, 12th June, 1996, personal communication). In striving for these incentives, which amounted to very little in most cases, the workers sometimes took unnecessary risks. This supports Dwyer's (1991) notion of voluntary servitude. It links to Hopkins' (1984) assertion that incentives induce production pressure which may in turn lead to accidents.

Crews were at times close knit, with little differentiation between contractor and employees. The contractor was nevertheless expected to 'shout' occasional trays of beer, dinners or trips. *"You know Marty is plain mean about some things. See, he'll shout at the pub sometimes [when] something might go wrong, like, once a log cracked against Percy's arm when he was cross cutting then Marty says, 'Ohh, well, you're right Tiger, I'll buy you a beer after work.' See, he wants you to work on there right next to the bully when its spewing mud and sliding round. So he'll give you a little bit of encouragement like one beer or something... Works your butt off and expects you to put up with shit, but what do you really get out of it?"* Bosses could place workers at risk by providing incentives to work harder.

However, sometimes the motives for giving incentives were more complex *"He's a nice bloke, Billy ... But he had the operation and he was in pain but he come in anyway... Yeah, well he's committed; he's there every day. His leg's knackered and he's still doing it, and we try to help him out, like he hit me up the other day, 'Ohh, my boots falling apart', and it's where his leg's bugged too, and the sole was all falling off one side, and I said, 'Ohh, I'll make a phone call,' and I got him a pair of new boots - and Christ you would have thought I got him a million dollars you know. 'Oohh, thanks, thanks for that, I appreciate it' and I said, 'Ohh no, if the sole's coming off, we'll wear it.' He's just one of those guys, he can't thank you enough, he's a real nice guy."* Obviously, the employee was working hard, despite having a permanently disabled leg. The contractor saw it as his obligation to help the worker, but he also liked the man. Ironically, by providing an incentive he was encouraging him to continue working hard on a leg which was deteriorating and painful to work on, thus increasing the likelihood of an accident.

The interpretation of 'perks' varied, depending on relationships and crew dynamics. One logger praised his boss for his generosity and concern for the crew welfare in his first interview, but by the second interview had fallen out with him over promotion. Consequently, his interpretation of the boss's gestures had changed: *"One of the boys said to me, 'Sam did all right - he gave us a leg of ham for Christmas.' I said 'Oh yeah.' I said, 'Big deal,' he said 'Ohh, that leg of ham is worth every bit of 70, 80 bucks.' I said, 'You're joking,' and he said 'No, no, ham is bloody dear,' I said 'You're bloody joking, did you read the price on it,' and I said 'Our leg of ham was \$35.' and his mouth dropped open."* He had also changed his mind about the safety of the crew. Initially, assuming he would become a foreman, he had been prepared to see the operation and the boss's gestures in a better light. Such a change in perception can influence other members of a crew.

It was evident, too, that promotion could change a person's stance on safety and production. *"I'm the foreman, so at the end of the day I don't care how it gets done, as long as they do it. See, I have to make sure it all gets done and if I don't the boss's on my back so I push the guys along - 'C'mon get it moving' - and all these fuckin' critical rules - shit, we'd never get anything done - and the bush code - I mean when I started out under old Hefy, I would get a bit pissed off if the boss told us to take short cuts, but now I spose the boot's on the other foot to a certain degree, and I reckon a good bushman can take those risks and get away with it, so that's what I ask of them."*

Allowances and hours

Equipment allowances acted as material incentives. New chains had to be purchased regularly and new chainsaws once a year. Where wages between groups were similar, difference was measured in allowances and incentives. *"We did have to supply our own saws and it was eighteen dollars a day for the last five years ... they must have added it up and decided that they could buy their own saws and maintain them themselves for cheaper than us... see, Len buys cheap chains which stretch to beggary ... who wants to use ratshit gear - who wants a loose chain flying off in their face? And so we lose out on our allowance, and...our base pay rate is the same as, say, Mal's crew, but they get those allowances and we don't. And, like, in the old days I could be careful with my saw and chain and make a bit out of the allowance."* Workers saw allowances as a form of additional payment. In the past they could easily work the system so they received more than they had to spend. As allowances became less generous, workers were more inclined to continue using unsafe gear to make a bit more

money. Such instances illustrate how money and material gain could over-ride safety measures.

Many contractors admitted allowances were decreasing relative to costs but claimed there was nothing they could do. Other contractors tried to maintain reasonable allowances. They acknowledged that while they found it difficult, it was also difficult for the workers.

Many workers said they increasingly worked longer hours. Some crews worked up to eleven hours a day and travelled two hours. Rarely were penal rates paid for overtime, and while in the past the boss would have paid for any extra hours worked, this was less common for workers involved in the last interviews. *"He expects you to work late - you know - ten or twenty minutes at night, and yet we never get paid for that now, and yet if we take an hour off for rain we get docked that part. We might even work more than an hour overtime, and you don't get paid for that - so you do him favours, and when you might work for him on a Saturday when you don't have to be out there, and it's pissing down with rain, and he knocks you off early so that's an hour less a day - he turns round and nuts off at you if you aren't gonna do him any favours."* Deteriorating group cohesion as a result of such resentment could in turn mean less communication and co-operation, with potential negative impacts on safety levels.

Two crews interviewed in the latter part of the data collection period decided to help the boss by working extra hours voluntarily. Loyalty and awareness of the contractor's difficulties required some sacrifice on their part. The workers felt their boss ran a well organised and safe operation, and blamed his financial predicament on the company. Such commitment to the group over the individual was not common amongst the loggers. However, it showed that in some cases there was selflessness, and thus more than just a transactional relationship between contractors and their workers.

Security of employment

Poor organisation and machinery led to the contractor failing to win good contracts. In many woodlot crews, workers could make reasonable money during good spells, but sometimes crews were laid off for up to five months of the year because of rain. When winters were bad, such as in 1996, or when log demand dropped dramatically, as in 1997 and 1998, loggers felt extremely insecure. Regular money became paramount, overriding what might otherwise be

sources of dissatisfaction. Several crews were observed working in extremely dangerous conditions: very slippery and steep, with thick mud sticking to the machinery, the logs, and to the workers themselves. *"Nah, Murray is no good, he has a bit of a bad temper, but the only reason you stick with... the contractor is the way they pay, and as soon as they don't pay you don't go to work. Well, if you don't get paid one week and you go to work and you don't get paid another week, well, what's the point, you're better off to go and look for another job... Murray's pretty disorganised, with machines and stuff, and the friggin mud and wet and shit can get too much, and he gets big milk bottle eyes when things go bad - throws his hard hat on the ground and shouts at everyone cause they're not working hard enough or if the friggin bully breaks down or something... but I think I'll stick with him - if he gets good contracts. Like, at the minute he is doing okay - got a block nobody else would work in. See, Toss was a better boss but he never seemed to care whether we were working all the time and you can't live on thin air, so you gotta stick with someone who gets the blocks."* This block was very dangerous and in the wet was unworkable without taking risks. In times of high demand for logs such a block would pay well, but when prices fell the margins were small. Nevertheless, loggers stayed in such crews because there was no other work available.

Loggers were prepared to put up with wage variations to stay in work. However, those with financial responsibilities found it hard to make ends meet and wanted to get into a crew with more consistent pay. *"The main problem in logging is pricing, Even if everything went smoothly there isn't enough in it. And the guys themselves go from one contractor to another contractor. They need a stable income to pay their mortgages and food every week."* Workers hoped to gravitate to those crews which were perceived to have optimum conditions. A sense of insecurity was largely confined to woodlots in the early interviews. But the downturn in the industry in 1997 and 1998 impacted on job security in company crews as well. Loggers who wanted to leave their present crews felt they could not, because so many crews were being laid off. Mechanisation was also reducing the numbers in many crews. Insecurity impacted on crew relations. *"I took a day off to get a tooth pulled out and he moaned about that - like, the dentist said I needed three days off, because it was a serious job, and he made me come back to work the next day - and I was half knocked out, like, I was feverish, and one minute I'd be white and the next I'd go all colourful again - and I had to work like that - and you go to work like that, and you can cause yourself an accident - but if you don't work you're out of a job - yet we never get any increase in pay, and we're the lowest paid workers in Kaingaroa ... if I could get the same money working in town, then I'd*

be there like a shot eh. ... there's no glamour out there, mate - it's just stress ... Safety has gone, the chainsaw costs have gone up ... They make you do windblow, and yet they don't pay you for it, and they don't train you for it." In the past, loggers said, this sort of situation would not have occurred in Kaingaroa. However, with declining crew numbers and extremely low tender prices, it was an increasing phenomenon.

Points of discussion

Material rewards were used to elicit better performance and more production, as well as adding to a logger's sense of worth. These outcomes could foster crew cohesion, forming a platform for safe operating conditions. Equally, they might encourage risk taking. However, in the current economic climate other factors contributed to unsafe activity. Pressure to produce and longer hours could impact on risk taking, yet with fewer jobs, loggers had little choice but to accept these conditions.

Material rewards formed the basis of the contractor-worker relationship. When wages and incentives were acceptable to the workers, dissatisfaction with having to take risks was less likely. This supports Ashby and Diacon's (1996) finding that workers are prepared to take more risks for more money. In this situation, material reward could be used to manipulate employees to work faster and hence more dangerously. Despite recognising the danger, workers might decide the money made the risk worth taking.

When workers were unhappy with the pay, their dissatisfaction tended to be directed at the whole operation. Usually the harsh conditions and danger were the first point of dissatisfaction. This was despite many loggers having taken on the job aware of, and positive about, those very things. When disgruntlement with safety was linked to discontent with pay rates, it was likely to be aimed at the boss, the systems he had in place, and perhaps to the pressure he placed on them. This illustrates the way that experience and changing circumstances sometimes altered perspectives.

In the past, the hours a logger worked were attractive, compared with other jobs. Increasingly, longer hours were worked for the same pay. Bosses regularly reported that workers were asleep in the van before it was out of the first block of trees on the way home. Studies have found that risk taking is more likely when workers are fatigued (Blank et al., 1997) and that there is a link between fatigue and accident rates (Hale & Hale, 1972; Savery

& Wooden, 1994). Increasing production pressures and longer hours had implications for crew relations, group cohesion, fatigue and ultimately for safe behaviour. Ashby and Diacon (1996) note that workers, regardless of their own estimations of the risk inherent in a job, may find it difficult to change jobs because of other factors. There was little alternative work available for which loggers had either the skills or qualifications. Though they complained about risk, they often had to put up with it, and felt trapped in the job.

Contractors who were aware of the importance of crew relations tried to maintain a positive crew climate by ensuring workers were satisfied with wages and conditions. Those contractors who were best able to meet such expectations were likely to attract the most skilled and hard working loggers. This enabled them to run their operations more efficiently, and to foster a positive crew culture.

Symbolic appreciation

Incentives, bonuses and annual extras

There was an important difference between incentives, bonuses and other gestures that served as forms of payment for services rendered, and those that acted as symbols of positive relationships between contractor and crew. 'Perks' could be interpreted as indications of the boss's regard and respect. An occasional tray of beer only cost the contractor \$20, but it held importance for the workers. Bosses who regularly made such gestures without demand for reciprocity were held in high esteem. *"As a crew we get on great, and all the fullas are mates, eh, and, see, everyone likes a bit of trout fishing, so Greg and Pete will take us for the odd day trip or maybe a weekend to Taupo. That's choice, but they are like that, eh? See, then maybe they will do a slap-up dinner or bring out some cans for the boys. On a Friday after a hard week or something. We get on that well you could say we're more buddies than workmates, if you know what I mean. I think sometimes Greg thinks he's the younger fullas' father, the way he looks after them."* It was difficult to separate the motives of the contractor and to distinguish between the desire to give the crew a treat simply because they were his friends, and the intention to create harmony and acquiescence which helped to extract higher levels of production. In some instances workers took risks to maintain good relationships.

Points of discussion

The degree to which bosses understood that workers expected appreciation varied greatly. At one extreme, some contractors did not even consider it. At the other extreme there were

contractors who fostered relationships, without any ulterior motive to exploit the workers. While Dwyer (1991) maintains that all such phenomena are financial incentives, loggers did not necessarily see it that way. The bonds developed in the bush indicated a desire to establish meaning and value in their lives, which fitted their own image of being a logger, and a man. A contractor who understood and facilitated this more easily established good relations in his crew.

As the economic situation worsened, it was the ability to maintain efficiency, allowing some leeway between demand and production, which made continuing symbolic appreciation possible. In turn, it seemed that, having established a positive relationship, the workers were likely to contribute further to that efficiency.

Verbal appreciation

Feedback through verbal appreciation is considered important in changing or reinforcing behaviour (Komaki, 1998). Nevertheless, there was generally a lack of feedback in many logging crews.

- *Praise and thanks*
- *The boss switches off*

Praise and thanks

Loggers reported that bosses rarely thanked them for a good production and even less for working safely. Nevertheless, loggers sometimes read between the lines: *"In his own way - he lets you know, though, he let me know a few times that your limbing's good or whatever it might be or you reached tally early. He just has his own way of saying it, like, he doesn't praise you too much, but that's enough. Like, you're not wanting to be praised or anything, but it is good to have a bit of recognition, and like I said, he never comes in and really spits the dummy [yells abusively]."* The crucial issue in communication and feedback was the workers' perceptions. If they perceived that the boss expressed appreciation and encouragement, that was sufficient.

Many loggers did not seem to expect praise. It was as if the use of words was not appropriate within the macho culture of the crew. Yet they did desire some recognition. And when they received verbal appreciation, they were obviously affected. *"See, a lot of contractors just don't understand how to motivate the men, and they need to tell a guy he's doing a good job,*

and that really motivates him, cause it makes a guy feel good inside...like, I don't know why I did the job, cause I never got a word of thanks... maybe because I love it and being in the top gang."

Many bosses did not see verbal praise as important. Acknowledgement of good work was more likely via a bonus or 'perk'. Nevertheless bosses claimed to give praise more than workers considered it was given. *"Oh you just talk to the guys all the time, you are going around yarning to them and sit down and have a chat to them at lunchtime, or smoko or whatever. You know - well done guys - keep up the good work."* One of his workers contradicted this, saying: *"Ohh, it's just the way he used to go round running after every one, trying to make everyone work harder than what they were doing, you know 'C.'mon you fullas, move it up'."* This worker maintained that the boss only talked about working harder and never encouraged the workers.

It was usually accepted that this was as much as could be expected. In fact, many workers felt it was appropriate for a boss to be negative if the situation merited it. *"It's okay for the boss to rip into the workers if the worker's at fault ...like if they're doing something wrong you just go and explain to them that they're doing it wrong and explain to them how to do it right but sometimes that doesn't work, and then you have to give them a good ripping down... It's just some people have to be told, swore at - hahahaha - no, that's right. If you don't listen the third time you get sworn at. Get the hell out of here."* Each crew had its own understanding of what was acceptable. When the boss's interpretation coincided with the crew's there was no conflict. Even rough justice was acceptable.

Usually, contractors who ran efficient operations with co-operative crews made more effort to praise. Moreover, they were sufficiently astute to differentiate between workers. *"There's ways of driving men, like there's certain guys who respond to being growled and told off, and there's certain guys that need encouragement, and I'm not saying that I'm an expert on it, but over the years you learn that you can encourage one guy who looks totally hopeless, but you can get another 5 % out of that guy, and he'll give you that 5% for ever."*

The boss switches off

"You can see if he is pissed off, he goes into these silent tantrums, doesn't talk for weeks on end." Sulking could be a symptom of the inability to maintain good relationships while at the same time retaining authority. Workers sometimes took advantage of an insecure boss, usually because they developed a contempt for him. *"Well Mark is the one, he will rage off at you, then you don't listen and if he has thrown his hat on the ground enough and jumped up and down but nobody has listened to him and we just laugh, then he gets in a bigger shitty and tries to act all silent and make out he's not talking to us. So he will walk round and not talk to us and pretend he's better than us ... Yeah, well, he's a jerk and we just laugh at him... Then he gets even madder. But, well, he's gotta come to the pub, because he's the only one with money. Yeah he's gotta get on with us cause he shouts [the drinks] hahahaha."* In such instances, the boss could be torn between establishing authority and ingratiating himself with the workers.

While some bosses understood that running a crew smoothly required positive and consistent communication, others seemed inclined to react less cohesively. General communication became minimal at best and negative at the extreme. *"You get a lot of bosses that won't even talk to their men. They won't even say good morning. Nothing like that - it's unreal, you wouldn't believe it really. Why do the bosses do it. I can't understand why they do it, because it only upsets the crew and the boys get upset and he doesn't get full production - I reckon that's for real, and if they got on with their men and treated them with respect, they would get full production every day."*

Points of discussion

Because the culture of the bush did not traditionally include verbal feedback, it could be difficult for a contractor to deliberately introduce such an approach. Many bosses had difficulty understanding and fulfilling their role as motivator and leader. With the changing shape of the industry it appeared that such an understanding was important, if the contractor was to ensure the co-operation of his employees. Bosses who were successful motivators managed to stand back from the operation and understand the importance of encouraging the workers.

The workers wanted a boss who had authority, but who was not distant from the crew. They liked to think he was still 'one of the boys'. Often, relationships in the crew suffered, because

the boss did not ensure the tasks/systems were running well. His frustration and anger led to the workers losing respect for him, and his retreat from communication with the crew. Loggers said that contractors rarely complained to them or praised them for safety related reasons. Almost invariably, feedback was connected with production and production systems.

Changes in the logging industry in the last decade, especially in company forests, have created a need for complex responses from contractors. The need to adapt, innovate, and adopt new methods had to be communicated to the workers. How a contractor disseminated that information impacted on the success of his operation. The way he built feedback, praise, and appreciation into this communication was important for the motivation of the crew. Rather than focusing their energies on adapting, some contractors reacted against change, or struggled and perhaps failed. Their old systems and minimal communication were not appropriate. They were increasingly ill-suited to the new forest environment.

Many studies have found that feedback is important for maintaining safety behaviour (Brown et al., 1981; Dussault, 1996; Fellner, & Sulzer-Azaroff, 1984; Kim, & Hamner, 1976; Komaki et al., 1980; Reber et al., 1990; Sulzer-Azaroff & de Santamaria, 1980; Zohar et al., 1980). However, feedback was not common in the logging crews studied. The lack of clear differentiation between boss and worker in daily roles seemed to reduce many contractors' awareness of the need to motivate through words. What little feedback there was could be vague. Such vagueness is purported to foster violations of rules and regulations of safety (Battmann & Klumb, 1993).

Company contractors were not necessarily good communicators or astute motivators, but put on a 'front' to imply that they were working in co-operation with their crew. While ostensibly meeting the new requirements of the company, some in reality adhered to the old ways. When the supervisor or bush inspector was around, they said all the 'right words' about their safety systems, and feigned open communication with their workers. However, interviews with some of their crew members indicated that there was considerable 'window dressing' in this regard. Behind the scenes the contractor might be communicative but in a negative or abusive way.

Aversive interaction

Eisele et al., (1998) found most workplace 'violence' came through verbal threats, verbal abuse and physical assault. Cole et al., (1997), in investigating violence in the workplace, classified violence as any threats, harassment, or physical attacks in the workplace. However, for the purpose of this study that range is covered under the term 'aversive interaction', and the term 'violence' refers to physical abuse.

- *The boss yells and swears at us*
- *Threats and assaults*
- *Abuse and workers' rights*

The boss yells and swears at us

Most loggers had experienced serious abuse from their boss. They reported that many bosses were quick to shout at workers. Anger could be directed at particular workers but was just as likely to be directed at the whole crew when the whole operation was going badly.

In some respects, the use of abuse such as swearing or screaming or physical violence was part of the culture of the bush. Older loggers remembered many instances where abuse was used to 'solve' problems in the bush. Workers accepted such behaviour as part of the harsh environment of their chosen occupation. *"There was none of this, 'Look, I'm not too happy about this' sort of stuff - like, 'I'm gonna give you a warning now old boy' sort of shit - it was just bush justice ... that was what happened when somebody cocked up - the boss let rip - give the guy a bloody dressing down, and that was that. Ten minutes later, it's all forgotten. I mean, sometimes it went further - and there would be a real bust up, but usually the boss would get it out of his system, the man would learn something, and it was all back to work, no regrets."*

Some bosses simply yelled at workers. *"He's only a little wee filla, and he's got some pretty hard guys working for him, but they produce for him, they're terrified and he's got this one skiddie, and he's a hard boy but he had him crying on the spot, even though he could have got up and flattened him. This guy got him DOWN there, eh ... one day he was tearing strips off them, yelling, because they were ten minutes late."* It was an indication of their acquiescence that these 'hard' men would put up with such abuse. Operating in a very rugged woodlot, this contractor's systems and machinery broke down constantly. The weather had created terrible conditions, and prices had fallen markedly. Workers put up with such abuse

because they wanted work. Even when yelling degenerated into excessive swearing, workers usually put up with it, *"I've had a boss, no matter what you done, he came up yelling and screaming at you and look at you in the face and be swearing at you 'You useless fuckin' cunt,' and even if it's not your own fault."* Such swearing is unimaginable in most jobs. In this case the worker was only seventeen.

Threats and assaults

While accepting abuse, workers did harbour resentment. Confrontations sometimes occurred. *"He was always on at me ... get fuckin' moving ... like, you get sick of it, and a man has to stand up for himself, I suppose, but then he might deck [knock down] you... Or that's what he said was gonna happen... At polytech it's 'Be safe, don't take risks,' then there's this fulla saying the opposite, and you gotta do it, or you'll get decked."* Often, threats were made with a degree of bluster, contractors relying on their position of power. Occasionally, a worker would challenge the boss when pushed too far. *"See, this guy wasn't all that experienced and the trees all used to come out all hairy, which slowed production down... and the boss used to tell him and whinge and moan at him to be faster and cleaner, and it got a bit heated one day and words were said, and they started swearing at each other, and then it come to blows. I couldn't believe it. Rolling round in the mud and punching."* It was not only the young workers who were bullied. *"I've never seen nothing like that boss for screaming at men. Flipping his lid all the time...like, our whole crew now used to work for him, and even those guys, like, they're in their forties and they put up with all that shit - even Bob, and you wouldn't think he would, but he did... And every so often Keith just loses it, and he's gonna hit anyone who comes his way. I mean he tried to run me down with the skidder once, because he reckoned I was going too slow."*

Some contractors acknowledged that they had been abusive in the past, but had decided it was ineffectual, and changed their style. *"I mean I used to get pissed off. I mean really pissed off. I would explode, and then I made a decision to never lose my temper again. I don't know why - I just suddenly stopped halfway through yelling at a guy, and thought - this is doing my head no good and sure as hell it's not doing the worker any good, and my blood pressure's going through the roof, so I walked away. Now if I feel I'm losing it I get out of it - walk away and cool down. And I've found that I rarely lose my temper at all now. I think I'm a better contractor for it too."*

Abuse and workers rights

While the Timber Workers Union ostensibly covers loggers, few of them belonged to it. Thus they had no one to advocate for them, and very few were sure about their rights. If abuse continued too long, workers would simply leave the crew. On the whole, they thought that contractors could do almost anything they liked. *"I don't think there is a union now. I think there should be a union for the workers sake, for their rights, like my contract says something about if you're kicking up a fuss, like you're not meant to kick up a fuss, you're not allowed to. I've signed that, it's inciting unrest, something like that. It's not quite the wording but close to it."* Those with abusive bosses often felt there was a place for unions but were either unaware of how to join or were scared they would lose their job if they did join. Some reported being told that they could not join a union if they wished to work in a given crew.

Several loggers were unsure whether they had an employment contract. They may have signed papers but were not sure what they had signed. They put up with abuse because they felt they had no alternative. *"He said we're not, why we're not producing is because we're mucking around using wedges. He said 'You're taking too much time scarfing, you're taking seven minutes to cut that tree... You should have had that tree on the ground and limbed within seven minutes,' and, well, we said, 'We have to fight to get to that bloody tree,' and I said, 'We need wedges,' and he said, 'No, no, you shouldn't use wedges, you should just push them over.' But this is where we made the mistake. We should have rung the bush inspector and told him what was happening. But Rob said just do the effing things and don't eff around with effing wedges just yelling at us... you gotta bow to pressure, so safety goes by the board."* In woodlot crews there was no one the workers could appeal to. And even company crew members were reluctant to go beyond the boss.

In the well run crews, where the boss showed concern for his workers, the workers usually maintained they did not need a union. They felt that their boss would not mind if they joined because he had no need to change the way he ran the crew. It is ironic that those who most needed a union were pressured not to join one, whereas those with least need could have joined without repercussions.

Points of discussion

Harbridge (1993) contends that when collective bargaining in New Zealand ceased, many waged workers ceased to have employment contracts. In crews where employment contracts existed, the terms were generally dictated by the contractor. Few workers understood their rights in relation to employer abuse, even if that was part of the contract. There were still older workers in the company crews who were once union members and who were more aware. Nevertheless, the majority of workers seemed to accept that they currently had few rights. Most evidence of acquiescing to carry out dangerous work following threats from the boss occurred in the fringe crews. This helps explain Fielder's (1997a) finding that woodlot crews have a much higher accident rate.

Workers often talked of going against regulations and common sense when ordered to by the boss, because he became so angry. Thus acquiescence and helplessness could put loggers in considerable danger. When logging was going through a good economic period, loggers could move to other crews. Indeed, in crews where abuse was extreme, there was often high staff turnover. However, as things tightened up, fewer jobs were available and workers were prepared to tolerate more abuse. It was during these periods that the frustrations caused by tight economic situations made abuse more likely.

Eisele et al. (1998) note that a large proportion of workplace violence is not reported, despite increases of violence during the nineties. They say that this is because of peer pressure or fear of reprisal. Further, with the mid-nineties has come a reduced workforce doing the same amount of work, with the accompanying production pressure, longer working hours and reduction of benefits. These often lead to stress and violence. Findings from the present study supported these contentions.

Cole et al. (1997) suggest that poor managerial practices and poor communication between co-workers and supervisors lead to frustration and possible violence. Other studies have revealed similar findings (Chen & Spector, 1992). Abuse and threats usually developed as production pressure became excessive, extraction systems broke down, and relationships worsened in the crew. The contractor's reaction was often to bully his workers into higher production, which, if unsuccessful, caused more frustration. Bandura (1973) suggests that violence as a means of asserting control is tenuous in a workplace and leads to breakdown, a

finding supported by Berkowitz (1989). Cox and Leather (1994) also noted violence in workplaces that had low levels of supportive activity from supervisors.

It was clear that aversive workplace interaction had a negative effect on the workplace climate, on co-operation between workers and contractor, and on the amount of effort put into tasks. There was the opportunity for a vicious cycle to develop, which led to further dysfunction and, almost inevitably, to increased risk.

However, in some logging crews there had been an apparent change in contractor behaviour. Those sufficiently self-reflective could see the merit in developing good relationships. They believed it helped production and the general climate of the crew, including safety. Almost invariably, the positive nature of feedback and communication in such crews accompanied good organisation. In turn, good organisation meant less likelihood that frustrating situations would arise.

Overall, the harsh 'justice' of the logging culture of the past was becoming less acceptable. This reflected the general trend in society towards disapproval of abuse and violence as a means of dealing with problems. The aversive behaviour of the past occurred in a relatively stable economic climate in forestry, where such behaviour was an acceptable way of dealing with problems. Much of the current violence and abuse seemed to derive from increased pressure, and an unstable economic climate. It was thus less to do with traditional logging culture and more with contractors not coping.

Contractor behaviour

- *Setting an example by working hard*
- *Setting an example through skill*
- *Instilling a sense of pride*
- *Developing a safety culture*

Setting an example by working hard

Contractors sometimes set an example deliberately, but just as often it was incidental. "Well, I don't think Larry and Dick are good leaders, like, no one respects them enough. You want someone that you not only admire but can relate to and look up to... but neither of them works that hard. ... in winter, like, he'll make sure he's in that yarder [covered machine]

where he's dry and warm, but in summer he'll probably try and get someone to do it and let him out a bit.... Like, my old boss, Stan, he never really thought twice to pick up a shovel and clear crap out the way, pitch in if things got too much. Different attitude really."

Workers expected the contractor to work as hard as the rest of the crew. They were aware the boss did extra administration, but this was not important to them. They resented bosses delegating dirty or dangerous work that they would not undertake themselves. *"There are too many guys in our industry now who are bosses now, and they have forgotten where they have come from.... they should always remember where they have come from, and they should treat the people that they're working with like they wanted to be treated when they were there."*

A well run logging crew had day-to-day extraction systems in place, with little need for constant overseeing by the contractor. He was part of the work force. When pay was poor, work inconstant, or production pressure intense, his work input could affect workers' commitment to the job. *"He's always there, and I've never seen a boss work so much. If you look at your boss, and he's working, you think 'Far out, this fulla's too much', and he runs a good crew, eh? We produce much more than we did in the other crew - everyone likes Chas - we give our all for that fulla."* In crews where the contractor did not work at the same rate as the men, there was resentment and contempt. *"He would be sitting in his truck and reading the paper - yeah, that's all - he'll come out and stand around and point his hand around and an hour later he's gone - he wasn't on the job most of the time. None of the boys liked him, they hated him. He never gave a stuff about us."*

Most contractors accepted that they must be seen to be working hard. *"I'll work as hard, if not harder, than any of them, and that's an inspiration to them - it's lead by example, and the men like to know I'm out there from daylight to dusk, and I gotta come home and run the business as well - do the paper work - and I'm there before them, and go home long after they've gone home... I let them know that, and they appreciate that, especially the ones that didn't know before."* That the contractor ensured his workers knew he had added responsibilities was part, not only of the work ethic, but of being seen to be working hard.

A hard working boss fitted the workers' perceptions of the ideal bushman: tough, skilled, and 'straight up'. Fairness was another important attribute. *"See, Cam is pretty fair ... maybe he drives us a bit hard at times, but he's a good contractor, and even if he won't listen to you*

sometimes, he pays all right, and he works hard out himself - like, I've heard of bad bosses, like the way they run things and their management, and they had bad attitudes. Just all those sort of things, and that's really important, like, if everything is going good, and the boss is on to it."

Setting an example through skill

The workers liked to see the contractor demonstrate his skill. *"They decide they are gonna become a contractor ... but if they haven't got all of those skills ... See, the men respect a man who can do it... The bush being a practical place, you have to be able to do everything, especially if you are the boss... That man must be skilled, and really he should be the best bushman in the crew, though that is not always the case. That's why Tim can lead his men across broken glass - because he's so good at his job."* Because loggers wanted to learn, and they appreciated good bush skills, the boss's prestige was strengthened if he demonstrated such skills. *"Cam is one of those fillas, you know he is a top bushman... he's an expert at this game. You can see him any time, skilled, eh? That's the thing, like I can learn off this fulla. Too much! I watch him and learn eh? He's a hard out fulla, and so we all go for it."* Those contractors who were good administrators and organisers, but not very skilled at logging, could have difficulty inspiring and motivating the workers because loggers placed so much importance on skill and physical ability.

Instilling a sense of pride

Bosses sometimes deliberately created situations to instil pride, as a way of recognising effort and skill: *"It's good to go to things like the chainsaw sports and things like that, and then they realise - shit we are good, we're as good as Murray's crew. Like, sometimes they clean up [win], and then they feel real good... like, they do have pride in being as good as the other crews... that self esteem is very important to them, so I encourage them to do things like that which will make them have a bit of pride in themselves."* The boss's opinion was an important indicator of how well a logger was doing. *"You hear of bosses pushing their employees to pass the limits, sort of thing - you hear it a lot, yeah. But Matt pushes you, and he expects a lot, but he doesn't force you, but makes it a thing of pride - to get that limit out."*

Developing a safety culture

In blue collar occupations which predominantly employ men there is often resistance to preventative safety (Holmes, Trigg, Gifford & Dawkins, 1997). If a contractor wanted to develop a positive safety culture in a logging crew, he had to overcome such resistance. Developing good crew relations was an important part of fostering safety culture. Respect for the boss contributed to the crew culture, as well as the smooth running of the crew. This link was less direct than the contractor simply providing consequences for safe or unsafe behaviour. However, it was just as important. Holmes et al. note that small businesses have difficulty in implementing workplace safety, but the present data suggests that there was considerable variation between logging crews, depending on what approach the contractor took.

Loggers hoped their boss would have an overall concern for his workers, and those who ran very good crews generally did. For instance, one contractor was involved in production thinning, which was paid on piece rates and was very physically demanding. He wanted a contract in clear fell, which was easier on workers and where a wage system could work. He demonstrated a sense of loyalty and responsibility to his workers. *"We're looking to the future and getting into that bigger wood, where it becomes a bit easier to get your tonnage, where your men are getting a bit older and a bit tired, so you can take them along there with you and look after them, nurse them along. I mean to say, they've done the hard work ... in bigger wood things become a little easier, it's where we stand - its gotta be a two-way thing - you don't get production by driving your men too hard, and what kind of life is it where you're squeezing every bit of blood out of your workers? These fullas aint gonna get any quicker as the years go by and there's too much risk in production thinning when you start to get older and slower."* Most bosses in the bush claimed concern for their crew, but whether workers agreed was another matter. Genuine concern built a good 'spirit' in the crew and engendered better communication. Good safety culture in a crew was dependent upon good crew relations, but these in turn depended on the contractor establishing systems that favoured positive interaction.

Points of discussion

In logging, there appeared to be certain pre-requisites which a contractor must have to lead the crew effectively. The expectation that the contractor would work like the rest of the crew was part of a tradition of the bush, which placed the boss firmly in the same camp as the

workers, and often at odds with authority and the companies. To gain respect, the contractor had to have good bush skills and knowledge of logging. Where a contractor met these pre-requisites, he became a role model for his crew. He might thus set an example for the crew regarding risk taking and attitudes to training and safety. It is important to appreciate the way that the contractor's standing in the crew, in turn, had an impact on workers' interpretations of processes occurring within the operation.

General discussion

Loggers maintained that crews operated more safely when everybody was happy and got on well with the contractor. Contractors agreed that this was important for a smooth running and safe crew. The literature also suggests that crew relations are an important part of a good crew safety culture, which in turn is a good indicator of low accident levels in the workplace (e.g. Cox & Flin, 1998; Turner, et al., 1989).

Komaki (1998) points out that people in charge of organisations play a critical role in the motivation of workers, and hence the atmosphere in the crew. In logging crews, modelling was important, and a contractor needed to be hard working and skilled. Workers seemed to have the need for a role model, perhaps stemming from the traditions of the bush. They gained more pride and placed more importance on rewards and praise given by a respected contractor than one who was lazy or unskilled. The admiration afforded a contractor played an important part in determining whether or not he could foster a good safety climate. The strength of respect and admiration for the contractor may be underrated by authorities attempting to set rules and directions for safety and training. In representing such an important influence, the contractor can as easily develop a risk-taking crew culture as a safe one.

At one level, crew relations were transactional. The contractor provided money, incentives, allowances and employment to the workers, and in return they provided him with labour and skills. The present study suggests that these transactions had to be seen to be fair by both parties for there to be good crew relations. It was the basis on which the functioning of the crew culture and organisation rested. There were no crews where rewards were consistently provided for safe practices, even though these have been shown to produce impressive results in controlled environments (e.g. Chhokar, 1987; Ray & Bishop, 1995). On some occasions a contractor or company might award a safety prize. However, these were usually too

infrequent to be effective in promoting safe behaviour. It was more usual for incentives to be focused on production, and, as Sundstrom-Frisk (1984) suggests, likely to induce workers to take risks rather than be safe. In the New Zealand bush it may not be practical to implement comprehensive reinforcement-based safety systems, particularly without the resources available to bigger organisations. However, in contributing to crew relations, rewards for general behaviour and production set the scene for other contingencies to affect safety.

Rewards not only provided material needs, but were symbols of a person's worth and place in an organisation. The boss's opinion of them and his appreciation of their input were important to workers. Some rewards, particularly incentives, were an indication of the contractor's regard. Feedback, which could either be positive or negative, also acted as a signal of their worth. Material and symbolic reward, and feedback contributed to crew relations and hence to crew culture.

Feedback was generally confined to comments on production related performance, but could have significant effects on sense of belonging, pride in self worth and hence co-operation. Zohar et al., (1980) linked feedback both to safety and to safety culture. Komaki et al., (1980) and Sulzer-Azaroff (1978) established that feedback is important in reinforcement of safe behaviour. Contractors who developed an awareness of links between crew relations, safety, and production made efforts to provide feedback for safety on a more deliberate and systematic basis. These contractors made a point of discussing safety at smoko and whenever an appropriate occasion arose.

Yukl (1994) notes the importance of monitoring for the assessment and appropriate use of contingent rewards and feedback. Few contractors had the time for consistent monitoring. Komaki (1986) found that managers who did not monitor directly led organisations with poor safety levels. Logging contractors with little time for monitoring had less control over safety behaviour and violation, and this was reflected in the safety culture of the crew. Carroll (1998) found that monitoring of safe behaviour was important, because it was a dynamic phenomenon, and managers needed to respond to changes as they occurred. Some loggers worked for contractors who monitored the crew regularly. They maintained that the contractor kept pace with the operation and simultaneously established good rapport with the crew.

Both positive and negative feedback were confusing for workers when seemingly random and unrelated to appropriate behaviour, giving support to Komaki's (1998) assertion that non-contingent consequences create dissatisfaction. Contractors who had no time to monitor their operation often reacted to breakdown in systems with abuse and other forms of punishment. Moreover, this punishment tended to be generalised to the whole crew. Rather than questioning the appropriateness of their own methods, contractors blamed such things as regulations, training and the workers themselves. This reduced group cohesion and co-operation. Since it was clear that co-operation was important if a crew was to function well, these contractors were exacerbating their own problems. Bass (1990a,b) suggests that non-contingent punishment tends to encourage confusion and consequent learned helplessness. Workers noted that safety climate deteriorated when workplace relations broke down through aversive interaction. Sometimes, to avoid punishment, workers rushed tasks to please the boss. As McMoore et al. (1998) suggest, where workers acquiesce, they may tacitly agree to take risks, and when demoralised, are more likely to make errors. Violations are also likely.

Importantly, Cole et al. (1997) link poor organisation and task performance to workplace violence, something which clearly emerged in the present study and which was a two-way relationship. Smith and Petersen (1988) found similar two-way interactions, which, when negative, could lead to more frustration and abuse. It was clear that workplace culture was adversely affected by abuse and violence, which gives further support to Cole et al.'s findings. Dedobbeleer and Beland (1987) also linked good organisation with good workplace relations and made the point that workers must believe that their workplace is safe. Workers in crews where the contractor fostered a positive crew culture tended to feel their crew was safe, and complained less about being forced to violate regulations, or being put in a position where error was likely.

Because some contractors did not understand the repercussions of their abusive behaviour, but noticed relations were deteriorating, they tended to sulk or become aloof, which further added to tension in the crew. Sulking, interspersed with abuse, was particularly destructive to crew safety culture. Cole et al. (1997) found that such a workplace climate led to reduced production levels, high staff turnover, absenteeism, and burnout. These consequences were often reported by loggers in unhappy crews. Cole et al. note that such problems have consequences for safety.

Where crew relations were positive, the functioning of the operation was facilitated. A smooth running operation enabled a contractor to retain good contracts and to build effective systems, and a virtuous cycle could develop. Contractors who deliberately developed good crew relations reflected on the links between communication, co-operation, monitoring, feedback, training, safety, and a smooth running and productive crew. However, the constant changes in the industry made it difficult for many contractors to maintain a positive momentum. This concurs with Carroll's (1998) assertion that only when a safety climate can accommodate change by ensuring that it remains compatible with the safety culture will safety levels be preserved. The contractor must respond to interaction within the crew and at the same time moderate and mediate incoming influences which affect the crew, such as company policies, regulations and the economic state of the industry.

Within the dynamic changes engendered by globalisation, a new type of contractor was emerging who was more aware of the part that good crew relations and a positive work culture played in production and viability. This supports Sarkus's (1996) assertion that new leaders emerge when major change demands new approaches. These contractors were more reflective and more deliberate in monitoring crew activity. They assessed the needs of crew members and, in meeting those needs, fostered a sense of shared purpose. They understood that good crew relations were vital and knew what was required to achieve them. They questioned traditional ways and rejected them where they were inappropriate. These contractors understood the integral part safety played in a successful logging operation.

Thus the contractorship/leadership of the crew was dependent not only on good organisational skills but also on developing good relationships. This involved transactional processes, such as rewarding, but incorporated concern for workers as well, inspiring respect through example and expertise. This implies a degree of inspiration and individual consideration suggested to be a necessary part of transformational leadership (Bass, 1985).

In more modern, efficient crews some contractors deliberately set out to create a culture which fostered good communication, upgrading of skills, and safe and organised task behaviour. They achieved this through ongoing monitoring, and consistent positive reinforcement. Those contractors who developed such an approach and were able, as a result, to improve the functioning of the crew were likely to refine their managerial/supervisory skills further. The contractor was able to invest more time and energy

in training and safety, which indicated to workers that he had concern for them and their future. He was less likely to demand violation of regulations, and so the workers' opinions were reinforced. Errors were less likely as well, because there was time to consider and plan, and time to improve skills. Overall, this placed such contractors in a position to gain the better contracts. Because they developed positive crew relations, they were able to retain workers in an industry which traditionally has a high turnover. This enabled crew skills and experience to build, which further added to competitiveness.

As industry changes continued, contractors who could incorporate good relations with good organisation were best placed to accommodate and take advantage of that change. However, increased competition and downward trends in the log market could counteract improvements which otherwise may have resulted in better profits and safety.

Building blocks for a theory emerging from the data

This chapter focused on relations within logging crews, and how they are affected by immediate consequences and stimuli, as well as the wider processes within the industry.

Crew relations

1) While recognising that the type of person who goes logging determines some of the perceptions of risk and safety loggers may have, nevertheless, a contractor can modify or change those perceptions and attitudes through the consequences he provides. These consequences include:

- a) material rewards
- b) symbolic rewards
- c) verbal appreciation
- d) aversive interaction
- e) instilling a sense of pride.

All of these may encourage safe behaviour, but may equally encourage risk taking behaviour.

2) The contractor may influence behaviour within the crew through modelling behaviour by:

- a) working hard and showing workers he is prepared to do what he expects of them. This may elicit risk-taking behaviour or it may, conversely, engender a sense of shared purpose which improves communication and co-operation,
- b) demonstrating skill and knowledge which instil confidence and co-operation from the crew.

- 3) The contractor is the crucial player in determining the culture of the crew, including the safety climate, through combining the crew relations with good organisation, adherence and promotion of the regulations, and facilitation of learning.
- 4) The changing demands of the industry, which have brought new systems of extraction, new pressures to produce, and new training and regulations, impact on how a contractor relates to his workers.
- 5) The ability of a contractor to understand the need for appropriate behaviour to suit the new environment determines how successful he is at coping with change and pressure.

Transformation of logging

At the second level, the transformation of crews also comes via the development of crew relations.

- 1) Contractors who have the awareness and skill to respond to change and pressure by motivating and educating their workers, are most likely to retain levels of cohesion in their crews which will ensure the systems they have in place run smoothly.
- 2) By ensuring these processes are in place the contractor will retain his place or move up in the hierarchy and thus survive.
- 3) Those who fail will increasingly feel pressured by the regulations and demands of the industry and will drift to non-mainstream activities.
- 4) The gap between the best crews and those operating in a reactive manner will thus widen.

Chapter Eleven

Conclusion

The specific discussion of the findings has taken place in each result chapter. Therefore, I will integrate the discussion points of the main findings and develop the emerging theory in this chapter. Recommendations will be made and directions for future research suggested. The results covered different aspects of logging which affected safety, both directly and indirectly.

The findings lent considerable support to existing notions of accident causation. There were indications that young males in logging have propensities to risk similar to those found in other studies with comparable populations. Evidence that monitoring and feedback were important for introducing and maintaining safety behaviour supported behavioural accident theory. Similarly, poor maintenance and inappropriate use of machinery, inadequate use of PPE, high fatigue levels and other factors of ergonomic interest clearly contributed to danger. Enforcement of regulations was minimal and non-compliance and violations were common. Likewise, error emanating from poor organisation or lack of skill and training was reported frequently by loggers. Production pressure played a significant part in violations, risk taking and error. It was clear that safety culture was influential in accident levels. These findings support existing literature. However, the links between these specific factors and the overall context of the workplace provided a different perspective on safety in logging. Much of the existing research has investigated accidents and safety using quantitative methodology, which focuses on measuring specific constructs. The intention of this research was to identify processes which impact on safety and investigate how these link and interact. It was therefore necessary to look at the whole logging operation.

It was clear that the dynamics of the wider society, the economy and the competing interests of workers and employers could lead to situations which facilitated accidents, as suggested by Dwyer (1991) in his sociological perspective on accident causation. However, different workplaces and occupations may involve risk partly because of workplace-specific factors. The explanations for accidents and unsafe levels of operation offered in this thesis are particular to the New Zealand logging industry. Nevertheless, they may provide understanding and insights of accident occurrence in workplaces with similar characteristics. There are factors which combine to make New Zealand logging unique. Some of these are

specific only to New Zealand, such as the HSE and the ECA. Others are specific to certain occupations, for example the isolation of the workplace. When combined, they create a unique environment.

New Zealand logging has strong traditions which have contributed not only to the present culture of the forest industry, but also to general perceptions of loggers and their place in society. The logging culture has developed in a demanding physical environment which dictates that safety is a critical issue most of the time. The patterns of behaviour and the work methods and techniques have evolved in this environment for nearly two hundred years. There is suspicion about new ideas imposed from outside by people who are perceived to have little understanding of logging. There is still great reverence for the ways of the past, when there was little interference from authorities. Isolation from the rest of the community has allowed a set of norms and values to develop which are unique to the forest industry. Loggers generally come from lower socio-economic groups with a low education level and this may influence their perceptions of regulations and formal training. The industry specific training scheme (FIRS) has slowly, and in many cases reluctantly, been accepted as the training standard for New Zealand forests. It has a relatively practical base but is often seen by loggers as little more than an adjunct to the 'proper learning' which takes place in the bush.

The logging industry has been through a period of change which has impacted on the relationship between crews and companies. Once, the majority of loggers worked for the New Zealand Forest Service. This has been sold in parts, mainly to multinational corporations. There is now a contract crew system which has completely replaced the waged crew system. Along with this, there has been a change in the economy of the logging industry. It has moved from a buoyant industry in the 1980s and early 1990s to a depressed one from the mid nineties onwards. The global market has had a huge impact on logging, partly because of the dominance of multinationals in New Zealand logging, but also as a result of general deregulation in the New Zealand economy. This has led to greater competition, cost cutting and restructuring.

The regulations provided via the HSE were designed to improve safety in the workplace. The Act has had an impact on the focus of logging crews in general, although not necessarily as was intended. As research has found (e.g. Carson & Johnstone, 1990; Langley, 1998), the

passing of legislation, and even inspection, is not necessarily a prescription for reduced accident levels. In logging, the emphasis following the HSE was initially on improved safety and training, but shifted to an emphasis on compliance to avoid prosecution. Increased production pressure further encouraged this change in focus. Many contractors had difficulty in coming to terms with the Act. Even those who did understand the Act, and were able to develop effective strategies for compliance, did so on the company's terms by allowing the focus on unsafe acts to continue. Woodlot contractors have less pressure to comply because they have only the bush inspector to contend with. The bush inspectors tended to perpetuate the 'blame the victim/unsafe act' focus as well, rather than investigating wider processes.

Compliance strategies were developed, but whether they improved safety or not was another matter. The problem lay in whether these strategies were properly in place at all, and if they were, whether they were effective. There is evidence to suggest that compliance improves safety levels (Nelson et al., 1997), but there is also evidence of staff cover-ups prior to an inspection, particularly when inspections are infrequent (Lindell, 1997). This seemed to be widespread in the New Zealand bush, which suggested that current inspection procedures did not ensure compliance.

The other focus of the HSE was to ensure that workers were trained to a level of competence. The Forest Owners Association (FOA) promoted the FIRS standards as the training benchmark. This has considerable safety content and has been accepted by OSH. Although research on the effectiveness of safety training is equivocal (Johnston et al., 1994), the industry through FOA and the Forest Industry Training and Education Council (FITEC) continue to insist that training will improve safety.

The effectiveness of the FIRS system was disputed by many loggers. They questioned the validity of a book-based programme which claimed to develop the variety and subtlety of skills needed to operate safely and competently in the bush. This is particularly in the woodlots, which have a more varied environment than the big company plantation forests. There are parallels between this belief and the contentions of Rasmussen (1982) and Reason (1990) that skills and rule based learning will not suffice when responding to an unpredictable environment. Although much of the criticism was on the content of FIRS, it was equally directed at the implementation. This was important, because there was variation in how

training was implemented in different crews and training schemes, as well as how it was transferred, maintained and extended.

In those crews where FIRS was recognised as a minimum standard to be maintained and extended, there was a more positive perception of its effectiveness. In such crews, processes identified by safety researchers as important tools for training were used effectively. These techniques, stated to be important by Komaki (1986), included monitoring, assessing, reviewing and then providing reinforcement and feedback. It must be stressed that in logging crews these were not always systematically implemented. Nevertheless, there were indications that a positive approach to training included these strategies. Training which was effective also included a combination of instruction, observation, and trial and error, which was circular and ongoing. Critical to this process was the time available, a competent instructor, no pressure to produce beyond the trainee's capacity and a positive crew culture.

In addition to direct consequences provided in training, there were competing or facilitating consequences from other sources. The crew culture might give emphasis to the safety elements in FIRS and encourage ongoing training. This was generally coupled with a shift away from the old values of the bush, which included macho behaviour, risk taking, and sometimes violation.

Production pressure not only conflicted with the demands of the HSE, but with the use of many techniques prescribed in FIRS. Production pressure came from two main sources. Firstly, there were ongoing reductions in log prices which forced contractors to lower their tenders. Secondly, there was dysfunction in the organisation of many logging crews, which produced breakdown, disruption and hence reduced production. Such production pressure not only shifted the focus onto increased output, but it also reduced the time available to train, produced more error, and encouraged violation.

Production pressure indirectly affected crew relations and crew culture. Poor organisation, delays in meeting targets, less emphasis on safety and training, and resulting frustrations led to a breakdown in crew interaction and a negative safety climate. In the long term this impacted on the safety culture and the impacts of poor crew relations flowed back to affect organisation and ultimately training and safety. Company crews did have the backup of the company infrastructure, which assisted in organisation and allowed more time for training and

development of safety systems. The fact that woodlot crews did not have that support could impact on other aspects of the operation negatively.

Thus the safety levels of logging crews in New Zealand are affected by critical influences which in many respects are involved in feedback loops. When there is a breakdown in one, it can affect one or more other factors. Often loggers looked at accident causation, as well as other aspects of the logging operation, without noting that there were connections between processes. It was necessary to draw inferences from loggers' remarks, to make observations, and to make connections based on the overall data.

There are complex interactions within workplaces, and these produce a safety culture. This holistic view of workplace safety has been investigated in the safety culture literature. Pidgeon (1998) recognises the part that organisation plays in safety culture development. Cox and Flin (1998) suggest that, too often, attempts to develop a safety culture do not take into account the underlying framework of organisations. The importance of doing this was evident in the present study. Any theories or research into accident prevention should take account of the way that a factor might assume a stronger influence in one situation than another. The prominence of particular factors may change the dynamics which contribute to accidents. An example of this is risk taking. McKenna (1987) found significant evidence that young men had a propensity to take more risks than other groups. However, young loggers in the present study who maintained they had indulged in risk taking behaviour in previous crews noted the change in their behaviour and attitudes when they joined a crew where the contractor fostered safe behaviour.

Basis for a theory of the central role of contractors in accident causation and safety

The influence of the contractor

In the present findings, as each part of the total culture of the crews was analysed and connections made, the overriding theme which emerged was the role that the contractor played in most of the operation.

The contractor, because of the changes which have taken place in the industry, had taken on numerous roles which were not demanded of the old foremen of the Forest Service days. He variously acted as worker, supervisor, safety officer, planner, negotiator, personnel officer, manager, employer and, last but not least, friend to his workmates. He had a dominant role in

logging crews as a filter of incoming influences. He developed the systems of organisation, the crew culture, the levels and quality of training, and the safety systems. He thus played a large part in determining safety levels in the crew. Figure 2 portrays the contractor as a filter and a catalyst.

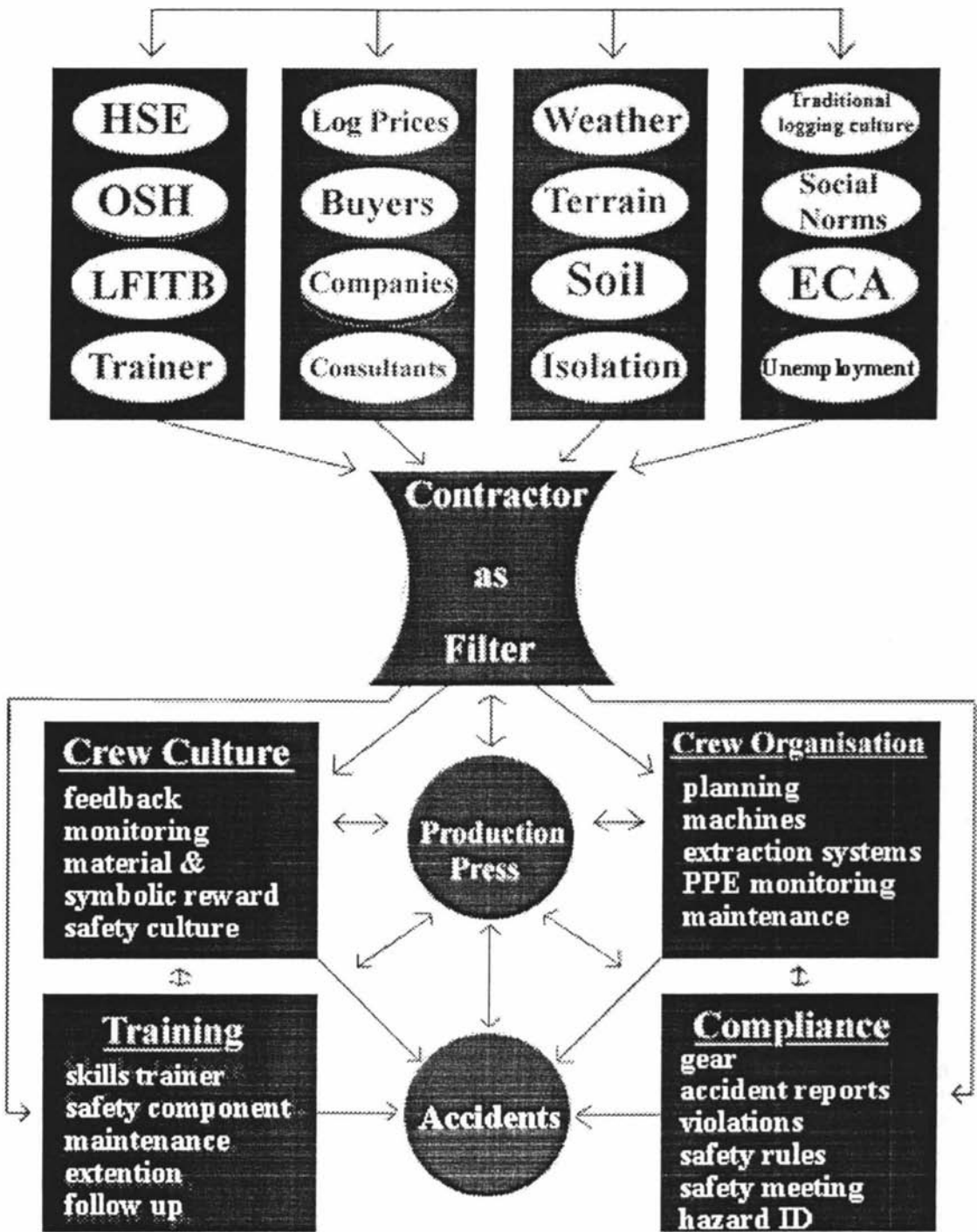


Figure 2: The contractor’s role in filtering influences affecting social processes which determine accidents in logging crews

Figure 2 illustrates how the contractor intercepted most of the influences from beyond the workplace and filtered them to the crew. His interpretation of the HSE, companies' requirements, the Resource Management Act's (RMA) environmental rules, ECA, and other demands of the wider industry, were integrated into the running of the crew. It was clear from interviewing a variety of loggers, bush inspectors, and other members of the industry, that crew culture, crew organisation, training, skill levels, machinery used, quality and quantity of production, and safety systems varied greatly. My own observations supported this finding. Not only was it clear that such variation affected the safety culture of the crew but also that the contractor was very influential in shaping these factors. In some crews this was a very deliberate process. In many fringe woodlot crews there was a less conscious attempt to co-ordinate all activities, and thus the contractors' influence in these crews lacked focus and was more reactive.

Thus the impact the contractor had was not only as a filter, but also as a catalyst. He used his understanding of incoming information to shape the processes in the crew. This has some parallels in the literature, though in a less all-encompassing sense. Clarke (1998) found that safety culture is strongly influenced by the manager's actions and attitudes, which in turn are partly determined by changes from outside the workplace. Carroll (1998) supports this notion, noting that safety culture is an ongoing process and as such, responds to changes in society and the economy. Carroll found managers using monitoring and assessment techniques in their organisations could respond to those changes. The changes in the logging industry made the role of contractor even more central to crew processes.

Because the contractor was involved at virtually every level of the operation it is not useful to try to separate his roles. They were interactive, with feedback loops and two-way causation. However, by beginning at any point in the operation and elaborating on the causal processes connected to that point, it becomes clear how these processes are dependent on each other. For instance, training varied enormously from one course to the next and from one trainer to the next. Consequently, there was considerable variation in the skill levels of 'qualified' trainees. Because of this, the contractor's approach to training and trainees was important. Certain contractors had gained good reputations. They could pick and choose which trainees they employed. Thus the better contractors often got the best trained workers. But even when employing a less well trained worker, they spent more time with the newcomer, easing them into the job, developing their skills and ensuring that they maintained learnt ones. Such a

contractor tended to enthuse his workers to strive for new qualifications and skills. He ensured that time was available for ongoing, comprehensive training. He exposed loggers to learning situations without putting them at risk. This kind of attitude meant the contractor usually had a low turnover, because workers were keen to stay in the crew. He was able to carry on with training his crew to a high level. Such an approach was exemplified by one contractor who had eight out of his nine workers with National Certificates in Harvesting, a qualification rare in most crews.

But contractors' reputations were not based solely on how they managed training and learning. Generally, they were also known to run efficient operations, and therefore had reasonable profit margins. There were few breakdowns or delays, and so there was more leeway. Contractors could spend more time monitoring both systems and employees. They had the time to invest in maintaining worker skills, and providing opportunities to extend those skills. Such contractors seemed aware that good training made organisation easier. Workers had better all round skills, and so contractors could assume their competence when planning.

Contractors with a proactive approach to running their operation invariably looked after their machinery. Many tried to update machines where possible, to maintain competitiveness. They carried spares, so that problems could quickly be fixed. They discouraged inappropriate use of machines. They ensured gear and PPE were maintained and adequate, and they conducted safety checks and hazard IDs regularly. Much of this arose from their awareness of the HSE and safety training, which they had usually undergone themselves.

These contractors established a culture of safety in the crew, both by emphasising how important it was to stay safe, and by admonishing anyone who violated crew rules or the bush code. Within this safety culture, a proactive approach to training and compliance gave workers the belief that the contractor had concern for them. This further indicated to workers that the contractor had concern for their welfare. Contractors built this safety culture into the organisational culture of efficiency and productivity.

Contractors were also expected to set an example. In working hard and being prepared to do the most difficult and unpleasant work alongside the workers, contractors performed an

important role in building crew culture. As Dedobbeleer and Beland (1991) point out, workers place considerable importance on words and deeds.

It was also important that contractors displayed expertise. Workers admired and respected a contractor with good bush skills and were likely to adopt his attitude towards safety. These contractors were aware of the need to provide a sense of pride and self worth amongst the workers and to make them feel part of a team. They made sure pay was adequate, and that there were incentives to work co-operatively and diligently. They also made gestures of appreciation and 'mateship' by shouts, trips and so on. Consequently, workers were prepared to work hard for the contractor. They were more inclined to want to stay in the crew and to take pride in the reputation it had. Certain crews had this reputation, whereas some crews, mainly in the woodlots, were regarded as last resorts for loggers seeking work.

In the most favoured crews, many of the traditional attitudes of logging relating to safety, training, bravado and risk taking were discouraged. Contractors were proactive in introducing new values to workers. Peer pressure was redirected towards safety and 'professionalism'. Contractors involved workers in decision making and fostered co-operation. Because of the cohesion and efficiency in such crews, there was less production pressure. Thus the potential negative effects of production pressure on crew relations, organisation, learning rules, skills and problem solving strategies, and the safety culture in these crews were minimal. Moreover, some contractors who admitted to having been abusive and negative in the past, reported having become aware of the detrimental affect that aversive interaction had on the operation, and having changed their approach.

Error and violation seemed to derive mainly from a combination of inappropriate attitudes, incompetence and inadequate skills, disorganisation, and production pressure. By organising competently and facilitating a positive crew culture, the better contractors reduced the likelihood of error and violation. Their deliberate approach to contractorship seemed to be fostered and accelerated by the changing dynamics of the industry. As the demand for logs lessened and there was less demand for logging crews, competition between crews grew. Security of contract became important. Additionally, the type of support systems available and the sort of blocks to be logged were important. Because companies usually provided economies of scale, large infrastructures, access to markets, and well managed blocks, company contracts were sought after. Companies had criteria for determining whether a crew

would be a preferred supplier or not. Meeting these criteria was an incentive for many contractors to improve their operations. The increased efficiency and functioning of the better crews enabled them to retain places in the company hierarchy. This meant that such crews gained further and ongoing advantage from working in better terrain, being better equipped, having better support systems, having options when weather was poor, and having better training facilities and thus a more skilled workforce. Thus the contractors even had an effect on which weather and terrain they worked in. This illustrates how research which concentrates on a single factor as a cause of accidents, such as the difficult physical environment, can conceal other contributing factors.

At the other extreme were contractors who did not actively respond to change but, rather, reacted more haphazardly. These contractors often tended to retreat to traditional ways, reacting antagonistically towards outside interference and change. The belief in traditional methods of learning, of hierarchy in the bush, and the ideal image of a bushman prevented an acceptance of new methods. Many of the woodlot crews were isolated from the mainstream of industry and were ill-informed. Failure to cope with the new ways and to succeed in the new competitive environment elicited further negative reactions, and while efforts might be made to satisfy authorities, or the company in the instance of poor company crews, the effort was half-hearted and often based on misinformation. Frequently, attempts were rendered unsuccessful because other facets of the operation remained dysfunctional. Rather than recognising this link, failure reinforced these contractors' belief that the new systems were unworkable. There was less emphasis on training, and little or no training maintenance or extension. Consequently, workers who were ambitious were less inclined to stay in the crew.

As production pressure mounted, the opportunities for training, planning, and machine maintenance diminished. Profit margins suffered, and less money could be devoted to upgrading the operation. The contractors in such crews found it harder to get work, because they were inefficient, had a crew with less skills and qualifications, had a reputation for being dangerous, and had difficulty retaining workers. In such circumstances, crew relations suffered, and these contractors were inclined to become negative towards their workers. As the crew became more dysfunctional, the likelihood of errors and violations became greater, and safety suffered. The contractor became locked in a downward spiral which was exacerbated by continuing pressure through reduced prices and lowering profit margins.

Abuse and occasional violence was increasingly prevalent in many crews, and this was indicative of added pressures in logging. It was clear that such behaviour occurred in the past but workers maintained that it was increasing. They usually linked anecdotes of abuse to production hold-ups, and failure to meet targets. The power a contractor had, with no moderating influence via unions, and little influence from bush inspectors, meant that abuse was also linked to situations where loggers were being forced to do work which was unsafe.

In such circumstances, violation could become extreme. Enforcement of the regulations in some crews was dependent on the bush inspector visiting and prosecuting where necessary. Because they had a large area to cover, few crews saw them more than twice a year. Moreover, the 'bush telegraph' meant his arrival was anticipated, and crews quickly tidied up the operation and adjusted their behaviour for the visit. Providing there were no serious accidents or fatalities, crews were able to ignore many regulations. And even when there were accidents, there was apparently considerable covering up of injury. Thus in most crews, and especially in the woodlots, the contractor was largely responsible for compliance. He could either foster positive or negative attitudes to the regulations, the bush code, and to safety. The contractors who were struggling to balance economic pressures with safety might increasingly bend the rules, and the bush inspectorate is not equipped to counter this. As changes in the industry increase pressure further, enforcement of the HSE becomes more important, because violation is more likely, and yet this may not be recognised

The contractors' influence is so central because of their unique role in workplaces such as logging. The contractor occupies a multitude of roles and thus makes almost all the critical decisions, and the isolation of the environment emphasises his influence. He filters information from beyond the workplace regarding legislation, training, contracts and economic pressures, and uses that information to organise his crew, to develop a skill base amongst his employees, to foster a crew culture and to determine safety levels. Depending on his general contractor skills, he may be more or less successful than his fellow contractors. His success will determine the degree to which he continues to develop his contractorship abilities.

Figure three illustrates the pivotal role a contractor can have in an isolated environment where there are few restraints from authority. In environments where there is unpredictability,

accidents come from many sources, mediated by the contractor through the social processes within the crew.

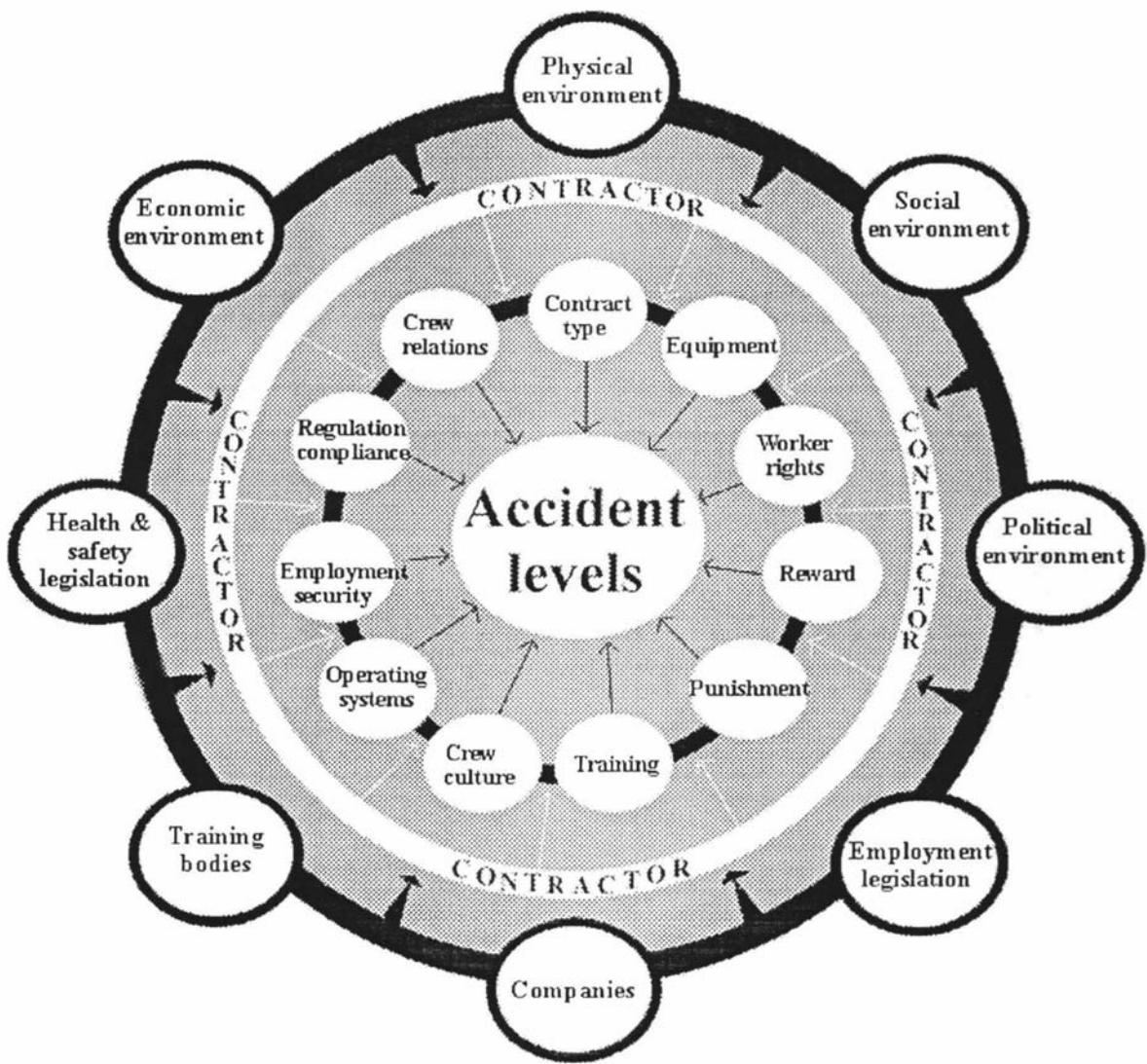


Figure 3: A contractor centred theory in accident occurrence in isolated, unpredictable environments

It is clear that, although there are links with the literature, the influence of the contractor needs to be superimposed on any theory of accident causation in logging. For example, feedback is important, as is goal setting as outlined by behavioural research (e.g., Mattila & Hyodynmaa, 1988; Sulzer-Azaroff, 1978) but, in logging, the approach of the contractor determines its success. Risk taking is also important, as is sensation seeking (e. g. Reason, 1990), but the contractor modifies crew culture to the extent that risk taking may be prevented altogether. The workplace safety culture has an important role to play in accident levels, as was noted by

Pauchant and Mitroff (1992) and Vaughn (1996). In a logging crew, the contractor is dominant in shaping that culture. The affects of training on safety may be equivocal, as Johnston et al (1994) claim, because no account has been taken of the realities which can impose on the ideal. In the bush, the contractor plays such an important role that any accident research must be viewed with scepticism if it does not recognise this influence.

At a broader level, the results also support sociological theory. This stems from the finding that there is an interconnectedness of processes within the industry, all of which impact on safety. However, the present findings suggest a far greater emphasis on the contractor than other theories. This has much to do with the unique position a logging contractor occupies. And it differs somewhat from the sociological literature, in that it does not see a clear dichotomy between workers and employers. The contractor is, in many respects, an employee as well as an employer. There are fewer clear boundaries between him and the workers. Moreover, he is in some ways a victim of company/capitalist exploitation of employees as is suggested by Dwyer (1991), and yet at the same time he is also exploiting his workers. Because he often becomes a friend of his employees, the relationship between contractor and workers is blurred. It makes for a unique relationship which may be peculiar to certain workplaces.

Ongoing changes and the transformation of contractorship

Clearly, the changes in the industry have encouraged the evolution of logging, as contractors with a proactive approach to organisation, planning, training and safety became aware of the connections between processes within the operation. Their interpretation of the HSE and company policies, their level of acceptance of systematic planning, new technologies and new methods influenced the way crews evolved. The most successful contractors developed innovative and flexible approaches. The ability to do this successfully was a pre-requisite skill for a contractor if he was to survive in the company hierarchy.

These contractors also developed improved man-management skills, which facilitated better crew relations. These, in turn, contributed to more efficient crew functioning and allowed a virtuous cycle to begin, where the contractor increasingly made the most of the personnel and resources within his operation. The awareness of the benefits of an holistic approach to contractorship encouraged further development of skills and methods. In the process the crew culture, and the systems of organisation became more conducive to a good safety culture.

As the present study proceeded, the evolution of contractors and crew processes continued. The widening gap between the efficient, transformational contractors and the less efficient approach of contractors with traditional responses to change, became evident. Moreover, because of the diminishing number of contracts available, contractors who responded more proactively were able to maintain a safe level of production. Those unable to cope the increased competition increasingly took more risks, and encouraged more violation, to remain viable. The company contractors who survived continued to fine tune their whole operations. I have referred to the most efficient of these as ‘transformational contractors’. At the other end of the spectrum, laissez faire contractors’ gave less attention to systems, crew relations, training and safety and more to haphazard production, because of the increasing pressures created by a tightening market and a more competitive tendering situation. Thus the industry has been transformed. This pattern is illustrated in figure 4

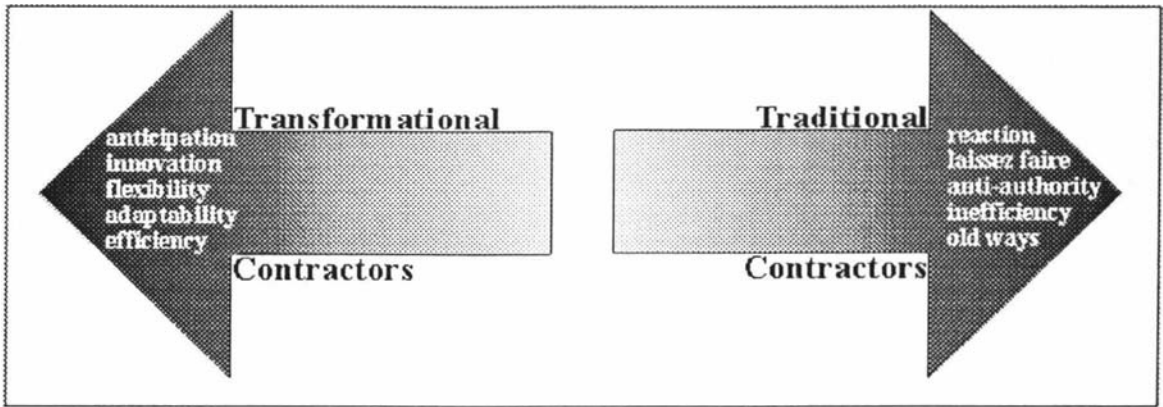


Figure 4: The widening gap between transformational contractors and traditional contractors.

It is apparent that the increased competition within the industry, along with the restructuring and changes in the relationship between contractors and companies, encouraged the development of transformational contractorship. The discrimination, through the company tendering process, between contractors who did and did not manage the changes positively was accentuated as competition increased. Thus the pattern of employment in the industry was transformed. This has parallels in the transformational leadership literature, which

suggests that the dynamic state of the global economy has produced a need for leadership which is responsive to change (e.g. Tichy & Devanna, 1990). According to the literature, such leaders are able to transform their organisations by developing new approaches and inspiring their followers to extend themselves, become selfless and more committed to the organisation. The present findings suggest a more practical role for transformational contractors. Their approach is bound up in a desire to succeed and the realisation that an innovative, holistic and positive approach to running their crews will greatly improve their chances of success.

The development of transformational contractorship has implications for safety. As they become more efficient, these contractors develop better systems and better crew relations. The basis of the theory which has emerged from the data, therefore, is twofold.

Firstly, the complex interactions within a logging operation mean that safety is the outcome of many interconnected processes. Whether these are positive and enhance safety levels or not depends largely on the contractor, albeit as a consequence of many outside pressures which he filters into the crew. Secondly, the ongoing changes, many related to the globalisation of the logging industry and society in general, mean that some contractors are striving to improve their operations through anticipating change and responding flexibly, adaptively and innovatively. Once in a virtuous or vicious cycle, the contractor and crew tend towards one extreme or another. The former adopt safer methods and the latter more risky ones.

Theory development

The basis for a theory specific to small organisations involved in hard physical work, in isolated and unpredictable environments, such as logging crews, is thus offered. It is comprised of two parts: the role that contractors have in contract crews, and the effects this has on safety; and the evolution of contractorship in response to the changing demands that globalisation has brought.

Theory stage one: The central role of contractors in logging safety

Contractors as a filter between the crew operation, and the industry and society beyond.

Loggers operate in isolation and with a great deal of autonomy. However, information and influence does come into the crew and change its culture, its behaviours and often its organisation. These influences and information do not automatically become part of the crew,

certainly not in its original form. Contractors determine most of what crews learn about safety, apart from what trainees bring from courses. Contractors give their own interpretation of this information. They not only filter the incoming information but, where they consider it necessary, may block it.

Contractors as catalysts for crew organisation and culture change

The contractor has considerable power and has the only position of authority in most crews. Where there is no worker representation, there is an imbalance of power. The contractor makes decisions which determine how the physical environment will be dealt with, and ultimately whether the crew will work in environments which are dangerous. He plays a crucial role in determining the quality and quantity of training and the degree to which it can be transferred and maintained. He facilitates crew interaction through monitoring, feedback, and reward and punishment. He determines, through the contingencies he provides, the extent to which violations are acceptable and error is likely. He thus plays the most important part in observance of safety in the crew.

The impact that a contractor has is magnified by the fact that decisions can have ripple effects. When contractors operate in a reactive manner, there can be unanticipated and often negative effects on other aspects of the operation. Contractors who understand this try to ensure their decisions account for the effects they will have elsewhere in the crew.

Skills necessary for maintaining competitiveness and group cohesiveness.

There is no system which trains contractors to be competent businessmen or employers. They may have the skills to be a bushman, a necessary pre-requisite in most crews as far as the workers are concerned. But they may not have the planning skills or the ability to manage men, nor the awareness of the need to develop these skills. Consequently, many contractors operate reactively, adhering to traditional ways. Others develop skills through experience and exposure to new ideas.

Theory stage two: The evolution of logging contractorship

Changing expectations of contractors deriving from globalisation

During the 1990s, there have been many changes to the role of contractors. Globalisation has brought new expectations for production levels, quality of logs produced, machinery used to extract it, training methods, responses to generic health and safety legislation, and the

constant upheavals which seem endemic in corporations trying to remain competitive in the world market. The contractors must interpret this information and adjust crew organisation to suit.

The failure to respond to changing demands in industry

There remains a strong influence from old style logging. In the past, reasonable profit margins enabled *laissez faire* contracting to survive comfortably. Loggers could start up their own crew and develop makeshift systems and operating procedures, and still get by. Training, adherence to regulations and general organisation were largely, ignored but time allowed loggers to learn, to develop good problem solving skills, and 'do it yourself' skills to maintain machinery and extract logs. As economic circumstances have changed and new demands have appeared, many of the traditional contractors, and some of the older style workers, have been unable to cope. Consequently, they have retreated from mainstream logging. Without the leeway they had in the past, their operations have become marginal and sometimes more dangerous.

Contractor transformation through flexibility adaptability, innovation and anticipation

In response to globalisation, and the New Zealand forest industry's subsequent reaction, contractors have had to change to survive in mainstream logging. As companies and the market, as well as OSH, have made new demands, some contractors have developed organisational and leadership skills and become more able to anticipate change. They have become more flexible in their approach and more innovative in their logging contractorship. This development of skills has included better understanding of health and safety and how crew relations and organisation impact on the ability of a crew to meet the expectations of the company and OSH.

The widening gap between transformational and laissez faire contractors

Some contractors have gained ascendancy in the tendering process by demonstrating efficiency and competence. However, because competition and change is ongoing, these contractors have had to continue to develop their skills. This process is facilitated by the advantages gained in what appeared to develop into a virtuous cycle. This has widened the gap between those who manage well and those who cling to traditional methods. Moreover, a vicious cycle was also apparent, where contractors unable to keep abreast of changes often struggled.

As the market continued to tighten, with fewer places for crews in the preferred company systems, those who were struggling to cope became frustrated and more desperate to meet production expectations. In placing more emphasis on production, safety and training suffered which impacted on crew relations. The contractor was inclined to demand more and more from the workers and become abusive and angry when production levels were not met. Crew members, because they might have limited opportunities for alternative work, often acquiesced and violated the bush code or made errors in their haste.

The development of a virtuous cycle and the transformation of the industry

As contractors reach increased levels of skill and expertise, they foster more co-operation and their crews become more cohesive. Better organisation benefits production, crew relations, skill development and safety, which, in turn, allows the process to continue. In this way, not only does the industry transform contractors, but also the contractors transform the industry.

Impacts of growing antipathy

An issue which emerged from the study was the degree of antipathy many loggers had towards the companies. This resulted from the belief that the companies were manipulating contractors and crews for gain. Loggers also felt that companies only promoted training and safety because it divested them of responsibility in the event of accidents. They felt that the companies' concern disappeared when demand for loggers decreased and they were not needed.

An important trend emerged after the final interviews. Evidence of this came from members of the wider industry as well as from contractors and workers whom I kept in touch with. Throughout 1998, and into 1999, tender prices dropped further. Even the most efficient contractors found it hard to make a profit and still remain safe. Production pressure increased markedly. During this period, many crews went out of business. All costs of training were passed on to contractors and their crews. Even contractors who had previously promoted extensive training geared their approach more towards meeting the minimum levels. The change from an holistic approach to a more production-focused, even one amongst the best crews, indicated that, beyond a certain point proactive contractorship was not sufficient. Safety was compromised, as workers were exhorted to work faster than was safe even in the best run crews.

Some companies have recently changed the way they contract logging crews to key suppliers (since mid 1998). These 'key suppliers' contract to these companies to supply up to twenty crews, each run by a subcontractor. Each key supplier employs administrative and supervisory staff and takes care of all training, safety and most of the support systems. In becoming a key supplier, the 'super contractor' has had to invest a large amount of money into his operation. Because he has such a large stake in his operation (usually borrowed money), he is even more dependent on the company for employment, and so has less bargaining power. Tender prices to obtain key supplier status were very low, and thus profit margins fell even further. The introduction of the key supplier concept is considered by many loggers to be a continuation of the companies' desire to manipulate the contractors and their crews even more. Recent reports suggest that worker conditions have worsened within the subcontracting crews (V. McLean, 23 September, 1999, personal communication)

A contractor identified by the OSH scientist, by a member of FITEC and by me as the epitome of the transformational contractor, tendered to become a key supplier. Because contracting company would no longer accept individual tenders, the key supplier contracts were sought-after. This contractor's tender was over a dollar a tonne higher than the winning contracts. He maintained that he would not be prepared to work for the successful tender rate, because he could not do so safely. He has left the logging industry.

The present distrust will make it difficult for the industry to develop strategies that every interest group feels it has a stake in. A commitment to safety remains an important pre-requisite for any programme designed to reduce the level of accidents in the New Zealand bush.

Recommendations

That there be a bush inspector staff presence in New Zealand forests large enough to ensure compliance and to offer assistance in safety and training. Bush inspectors should be encouraged to view accidents more holistically.

The HSE does not recognise the autonomy and isolation of logging crews. Most loggers who claim to work in dangerous crews, where violation is frequent, would like to see more bush inspectors. Moreover, they would like to see bush inspectors turning up unannounced and being stricter with contractors. Contractors feel there should be more education and information from bush inspectors. This is a valid point, providing it complements, rather than

replaces, enforcement of regulations. Workers claim that when contractors are prosecuted they tend to be treated too leniently. There may be room for instant fines, both for contractors and for companies or consultants who employ them. And, finally, OSH inspectors and prosecutors need to reassess the way they interpret the Act. The present study clearly shows that accidents and safety are not confined to individual behaviours but extend to the way a contractor runs a crew, and to the wider industry in which he operates. Decisions made by companies, and in some cases government, can have indirect repercussions for safety in logging crews. That workers are still receiving the focus of attention in investigations implies that bush inspectors have not yet fully understood the intentions of the HSE.

That logging contractors should undergo training in crew relations, organisation, and training needs, as well as regulation compliance.

Because many contractors become employers without any experience in either organising or man management, there is a need to develop courses which not only provide training in these kinds of skills but also in giving contractors an understanding of the linkages and interaction between different domains and processes within the crew. Such training should be provided by the industry, but should be independent of company influence. It should have a strong emphasis on demonstrating that safety is an integral part of any functional operation.

That the FIRS-based training standards should have follow-up built into their structure, with staff provided to assist contractors in monitoring maintenance and further development of skills

As part of FIRS standards, there should be clearer guidelines about modelling, instructing, and trial and error training which focuses not only on building skills and sets of rules but also on problem solving skills. Trainers and contractors need to have a better understanding of how to train. They need assistance in developing this knowledge and being trained to use that knowledge. Courses should be run which teach the fundamentals of adult education to trainers. Contractors should also be expected to sit modules which emphasize those skills. FIRS should have built in mechanisms for better follow-up and maintenance.

That a second level of training be established, geared towards recognising expertise.

There seems to be room to develop some modules which focus on expertise, as opposed to minimum standards. The original emphasis which companies placed on professionalism in logging to raise the standards of logging to a tradesman status has dissipated, partly because

of perceptions of the quality of FIRS, but also because companies withdrew their support for ongoing training. Contractors, instead, tended to train workers to the bare minimum because of costs. In order to retain experienced loggers in crews, and in the industry, there needs to be more emphasis given to giving status to expert loggers. A new set of qualifications should be developed which assess expertise, rather than minimum standards. As an incentive to loggers to aspire to this there should be some recognition through the pay system for expert status. This would encourage loggers to stay longer in the industry, thus retaining their skills, and also set higher standards for young loggers to strive for.

That greater recognition be given to safety awards, safety promotion, and the development of an industry-wide safety culture.

Currently, loggers get little or no reinforcement for safe behaviour. The focus of rewards is production. A greater emphasis in the industry on safety, and ascribing status and reward to safety, would add to current education and promotion and act as an extension to enforcement by OSH. It is essential that companies participate in such a process but also that workers are represented to give balance and voice to those most affected by logging accidents.

That OSH develop clearer guidelines and prescriptions for prosecution which should be agreed upon by the industry.

The HSE is generic and open to interpretation. It does not specify what is and is not a violation, but relies upon broad concepts such as 'as safe as is practical'. Moreover, it allows documentation to take precedence over genuine safety. Consequently, it has been used to shift the emphasis away from safety towards superficial compliance. With clearer guidelines and a more prescriptive bush code, workers would be more likely to know the rules and more awareness of when they are being forced to violate them.

That more effort be put into ensuring workers know their rights, have employment contracts and advocates.

Workers should have better access to union representatives. The module on workers' rights should be compulsory. There should be a worker health and safety representative in each crew, who should report to OSH regularly.

That the industry recognises that production pressure is a fundamental cause of violation and that it must be addressed if accidents are to be reduced.

Of critical importance to health and safety in logging are the pricing mechanisms and tendering for contracts. Because of increasing competition, some contractors are tendering at levels only feasible if safety is ignored. The companies rely on this to maintain their profits. There is no recognition for times when a contract crew may have no work and thus no income. Contractors may sacrifice safety for production in order to retain employment. Thus insecurity of tenure elicits serious violations, although that reality is not generally acknowledged by the companies. To give greater security and less fear of dismissal, companies need to carry crews when they have no work for them. There needs to be some recognition that contractors are only semi-employers and rely on single companies for employment. They do not have the real freedom to move between companies.

That the industry needs to recognise when companies reduce prices paid to their own crews, the price is driven down for woodlot crews as well, and this has repercussions for safety across the whole industry.

There should be a more concerted approach to retain minimum acceptable prices for a contract crew to operate with. Additionally, the industry should address the need for a joint approach between workers, trainers, management and contractors to training which lessens the financial load on individual contractors and workers, and ensures woodlot contractors get training both for themselves and for their workers.

Only with these initiatives will there be any chance that safety can become a priority in New Zealand forests.

Wider Implications

In the last ten years, the focus of forest planting has shifted away from big company blocks to smaller, privately owned blocks, planted by individuals and investment schemes. These have traditionally employed woodlot loggers. The findings of the present study indicate that woodlot loggers have fewer restraints on risk taking and regulation violation. Given that woodlot loggers have a much higher accident rate than company loggers, the implications for logging accident rates are serious. If the gap between well run company crews and fringe woodlot crews continues to widen, the difference in accident rates may grow.

While specific to logging in some respects, the changes which have brought added pressures to logging crews have had parallels in other industries. When commodity prices decline, there can be rapid and profound changes in how industries respond in the new global market. In industries such as fishing, building construction, and farming, which have unpredictable environments similar to logging, it is likely that similar trends will be found. Restructuring is part of a global trend. The increase in contract-type work has extended to many sectors of the economy. The restructuring comes largely as part of attempts at cost efficiency from organisations such as large companies and government departments. In contracting work out, they are distancing themselves from the responsibility of workers' welfare. They have no wages to pay, no accident insurance to pay, less liability for injury, and no need to provide security of employment.

This may place enormous pressure on contractors who do not have the skills to cope with the new demands, leading to a breakdown of co-operation in workplaces. Employment contract legislation does not necessarily protect workers' rights to safety or fair conditions. In isolated workplaces, where the contractor has autonomy in the day-to-day running of the operation, there may be few mechanisms in place which ensure that basic safety standards are upheld. When economic conditions deteriorate and place the survival of contract crews in jeopardy, it is likely that safety will be compromised. The apparent decline, in some companies, of social responsibility can create an environment of conflict.

Where there is little or no union presence, the workers' ability to bargain is weakened. Workers in occupations where there is a low level of education can be intimidated by authority, especially when they do not have the support of a union. When there are decreasing numbers of jobs available to them, they may be prepared to accept dangerous working conditions. It is likely that many such workers will have little understanding of their rights, or the confidence to assert themselves. Thus they are vulnerable to coercion from their boss.

When companies demand that contractors reduce tenders to the point where there is little room for profit, workers will inevitably be forced to work harder, which may increase workplace risk. Unless there can be a recognition that the burden of reduced prices must be spread throughout the industry, workers will be the first to suffer.

Limitations of study

The study took place during a period of considerable change. The present results may be specific to a particular period. Most of the participants were only interviewed once, though some crews were visited for observation more than once. Perceptions may change over time, and circumstance in which perceptions evolve may change. The cross sectional nature of most of the data collection may have restricted understanding of evolving processes. Moreover, the study was restricted to a single industry, and the processes in place in logging may be particular to that industry only. And finally, although there was considerable depth to the interviews, there was also variation of opinion and perception about critical issues for improving safety. While the present study has identified the contractor's role as critical to overall crew safety, there remains the question of how to take advantage of this understanding, to suggest interventions which would improve the safety culture of logging and thus reduce accident levels.

Suggestions for future research

- 1) Because the logging industry is in constant change, it is vital for similar follow-up research to build on these findings.
- 2) This study is confined to New Zealand loggers. Other workplaces with similar characteristics include small fishing boats, small construction crews, and farming operations. A study of the social and organisational processes which contribute to those accidents may be of value.
- 3) There is sufficient evidence in the present study to indicate that some contractors may lack the skills necessary for modern logging. A longitudinal study which uses contractor training as an intervention, with concurrent evaluation attached, may be of considerable value.
- 4) It would be useful to have multiple interviews for all participants to give greater understanding of how crew relations and safety culture evolved over time and responded to changing conditions. In the present study, where this occurred, there were useful insights into the process and changing perceptions.

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Appendix One

Exploratory Investigation

An exploratory investigation was carried out as a precursor to the major study. It was conducted initially as part of the ACC study already mentioned whose intention was to investigate the influence that training had on safety in the forest industries. It was envisaged that the ACC study would be largely quantitative and this investigation was intended to familiarise the researcher with the perceptions and experiences of loggers, the systems and equipment they used, and the training taking place. It was also to give me some directions with which to begin the main study.

Contacts were made with members of the industry Manawatu\Southern Hawkes Bay and the Central Plateau who made suggestions about a range of people who could contribute opinions and perceptions of issues relevant to the research. These included loggers, contractors, LFITB staff, forest managers, forest supervisors, forestry consultants, bush inspectors, polytech tutors, and polytech students.

Informal discussions took place and notes taken where appropriate. Several points of interest emerged including:

- there was a major difference between woodlot and company crews
- there had been increased interest in training, mainly in company crews
- there was considerable variation in attitudes towards training
- the focus on safety varied from crew to crew
- woodlot crews tended to operate in very different circumstances to company based crews
- some contractors and some workers were antagonistic to regulations and training
- many changes were occurring in the industry, not only in safety and training, but also in production systems and technology

I also familiarised myself with the LFITB FIRS modules, and the history of that organisation (see Rowsell, 1996) and spent time discussing OSH procedures with bush

inspectors. I attended polytechnic sessions and discussed aspects of training programmes with tutors.

It became apparent that training versus non-training was not a clear dichotomy. There was variation in time spent on training, conditions of training, and credibility given to the training system. A training programme in a clear, definable form did not exist for the whole industry and there were said to be influences which frequently impacted on training and safety such as availability of trainers and costs of training.

Members of the industry reported that there is great diversity of crews and logging operations in New Zealand forests. This suggested that any quantitative survey, designed to capture major themes, would need to be very large, and could miss topics important to some groups. It also became apparent that the logistics of getting a survey to sufficient crews and to a representative sample, and then returned would be extremely difficult. Members of the training institutions and OSH pointed out that it was likely that a biased sample would emerge because finding fringe woodlot crews who would be willing to respond to a survey might be difficult. Fringe woodlot crews tend to be make-shift operations which work on the edges of the forest industry and often outside the influence of OSH, LFITB, and other authorities. There is no register of them and hence no real records, and also they would be less likely to return the survey even if they did receive them.

LFITB estimated an illiteracy rate of 30% in the logging workforce (M. Newbold, 26th Jan, 1996, personal communication). Thus, a posted survey would present very real problems with comprehension. The number of surveys which would need to be conducted orally was beyond the range of the study I intended to conduct for this thesis. On the basis of this investigation it was decided to consider use of a qualitative approach, with interviews as the main form of data collection. Elaboration of the reasons for using a qualitative methodology and the specific type used are outlined in chapter five.

Appendix two
Ethics Committee Proposal

MASSEY UNIVERSITY

Human Ethics Committee

Name of Applicant:	Steve Rowsell
Status of Applicant:	Doctoral student
Department:	Rehabilitation
Employment:	Student
Project status:	Thesis project
Funding source:	Massey University
Supervisor:	Dr. Regina Pernice, Senior Lecturer
Title:	Accidents and training in New Zealand
Attachments:	Information sheet Consent form
SIGNATURE:	RESEARCHER: SUPERVISOR:

DATE:

DESCRIPTION

1.1 Justification

The forestry industry has a very high accident and injury rate world wide. New Zealand is no exception, and with the burgeoning forests planted in the seventies and nineties, more workers are likely to be involved in tending and harvesting than ever before. It is expected that by the year 2010 there will be three times as much productive forest as there is currently (LFITB Annual Report, 1993). Logging is a particularly dangerous activity. Fatalities are 28 times as high in this sector of the industry as the average occupation in New Zealand. Hospitalisation ratios are nearly as bad. (Forestry Industry Research Group, 1991).

Until recently the training of workers in forest skills had been a fairly haphazard and voluntary business. Up until the late seventies few workers were trained formally at all. However, since that period, a training organisation (Logging and Forestry Industry Training Board - LFITB) has slowly evolved a programme which has become the accepted training system for most of the industry. The training programme has, according to most groups in the industry, a high content validity. It is becoming increasingly used by both established companies and by the myriad contractors and gangs which make up the total New Zealand forestry industry.

Despite the training programme's wide acceptance, accident rates are not coming down as much as the industry expected (ACC Treasury, 1994; Houghton, 1995). There are many possible reasons why the training programme, which has a high safety content, is not producing the hoped for results. These include competing production pressures, poor leadership skills on the part of the contractors, macho culture within many groups in the forests, poor equipment, carelessness, poor implementation of the training programme, and poor management skills (Quinlan & Bohle, 1991; Hopkins, 1995).

Considerable research has been conducted in order to find reasons for accidents. Most of it has focused on the behaviour, beliefs and attitudes of the workers (e.g. carelessness, poor attitudes, poor equipment, poor specific skills and so on) (Gibson, 1994b). Much of this research has used formal survey methods. This has proved problematic in a group which has a high illiteracy rate and a negative attitude towards academic research. Little attention has been focused on organisational interaction at the workplace, to explore workers' and contractors' experiences of their jobs, and the environmental effects and influences which can impinge on training and safety issues. In light of the current surge in growth of the industry such a study is timely.

1.2 Objectives

The study will focus on the processes which make the work place dangerous to the workers and contractors and how both groups see the social and physical interactions in their daily lives.

1.3 Procedures for recruiting participants and obtaining informed consent

Participants will be recruited with the help of the local Forest Industry Training Groups (FITAGs) to obtain a representative cross section of workers and contractors from three regions of the North Island. These regions have been selected for the recruitment of participants on the basis of the accident rate, my contact in the forest industry and economic feasibility. The regions are: Bay of Plenty (low accident rate), Northland (medium accident rate) and Manawatu/Hawkes Bay (high accident rate). Twelve workers and four contractors will be recruited from each of the three regions.

Individuals will be personally contacted and invited to participate. The project will be explained verbally and in writing. Verbal explanation is preferred as it is considered less threatening to likely participants than an official looking document. A consent form will be taken to the interview for signing. Each participant will then be given an opportunity to discuss the research and its intentions.

1.4 Procedures in which research participants will be involved

There will be forty eight participants. Each will be interviewed in a setting of the participant's choice to maximise their feeling at ease. Interviews will be tape recorded and will take approximately 30 to 60 minutes to complete.

The format will be an open-ended question/discussion session with enough structure to ensure the topics of interest are covered: safety, training, weather and soil conditions, machinery, production pressures, leadership, and work culture. Participants will be encouraged to cover any topic which they consider concerns them in their daily lives at the work place.

In keeping with the Grounded Theory techniques, as soon as the first few interviews are completed, analysis will begin and direction or focus will continue to be refined as greater understanding of the complexities of the workplace emerge. This will mean constantly reviewing relevant issues to be tackled, and allowing for an evolving format of subsequent interviews.

After the interview(s) the participant will be reminded that they can have a summary of results.

1.5 Procedures for handling information and material produced in the course of the research including raw data and final research report(s)

Each participant will be given an ID number which will be used to label the tapes and the transcripts of the interviews and the corresponding names will be known only to me. The participants' names will

not be used in the thesis or in any other reports using the data. Audiotapes and transcripts will be stored securely, accessible only to the researcher and his supervisor, and will be destroyed at the end of the study.

ETHICAL CONCERNS

2.1 Access to participants.

Potential participants will initially be approached directly by the researcher, unless the FITAG resource person assisting access feels that it would be better if he or she approaches the potential participant first. There is a good deal of suspicion amongst many workers because of the various authorities which oversee the forest industry and these suspicions need to be allayed if valid data is to be obtained. In addition, the information conveyed to the participant by the researcher will stress the voluntary nature of involvement and outlines the participants' rights so that these are known from the outset.

2.2 Informed Consent.

Potential participants will be informed orally and in writing of the purpose and procedure of the study. The oral presentation of the research aims is important because there is a high level of illiteracy amongst workers in the industry. Their right to refuse to take part will be ensured as well as their right to refuse to answer any particular questions, or to withdraw from the study at any time without feeling any pressure to continue if they feel uncomfortable.

The verbal information will be given together with an information sheet (appendix 1) which explains the aims of the study. The latter will include names and contact phone numbers of the researcher and his supervisor in case of queries that might come up after the researcher has left. A consent form, (appendix 3), which repeats what is required of the participants and their rights will need to be signed by those agreeing to take part in the study.

2.3 Anonymity and confidentiality

All materials obtained during the course of the research will be stored in a secure place and will be accessible only to me and my supervisor. ID numbers will be used so that the material will be anonymous. The thesis and any other published material will use false names and will not contain information that will identify any of the participants. Tapes and transcripts will be destroyed at the end of the study.

2.4 Potential harm to participants

It is not anticipated that participants will be harmed by taking part in the study. Previous research has found that people enjoy sharing their experience and that at times issues are clarified through the process.

2.5 Potential harm to researcher(s)

None is anticipated. Appropriate safety gear will be worn where necessary and all OSH regulations will be adhered to.

2.6 Potential harm to university

None is anticipated.

2.7 Participant's right to decline to take part.

Each participant will be informed of their right to decline to take part in the study without feeling under any pressure if they choose to decline. In addition, they will be informed that any questions or issues that arise which they feel uncomfortable with, they are welcome to decline to answer or to signal their discomfort. If they change their mind about participating at any time during the study, they will be assured that this is acceptable and will not be viewed in a negative way. Finally, if data is asked to be withdrawn, this will be accepted and respected.

2.8 Uses of the information.

The main objective of the study is to produce a thesis and to publish the research in peer-reviewed journals.

2.9 Conflict of interest.

No conflicts of interest are foreseen.

2.10 Other ethical concerns.

We do not consider the research to have any other ethical concerns.

LEGAL CONCERNS**3.1 Legislation**

Given the consent process, confidentiality assurances, and security of materials, we see no issues arising in relation to any legislation.

3.2 Other legal issues

We foresee no legal issues concerning copyright, ownership of data or materials, or other legal matters arising from the research.

CULTURAL CONCERNS

We do not think that there is any concern for cultural issues in this project.

OTHER ETHICAL BODIES RELEVANT TO THE RESEARCH

5.1 Ethics committees

The project has only been submitted to the Massey Human Ethics Committee.

5.2 Professional codes

The study will be conducted within the guidelines of Massey University and the New Zealand Psychological Society.

OTHER RELEVANT ISSUES

There are no other specific matters which we wish to raise with the Ethics Committee for discussion.

References:

ACC (1994). Analysis of forestry claims. 1990 - 1994. Wellington, New Zealand: ACC.

Forestry Industry Research Group (1991). *The epidemiological diagnosis of injury to forestry workers: The final amalgamated report*. Wellington: Accident Compensation Corporation.

Gibson, R. (1994). *Attitudes towards safety in the forests*. Palmerston North: Massey University (Unpublished masters thesis)

Hopkins, A. (1995). *Making safety work*. Sydney: Allen & Unwin.

Houghton, R. (1995). *Injury to forestry workers : A summary report*. Dunedin: University of Otago.

Quinlan, M. & Bohle, P. (1991). *Managing occupational health and safety in Australia*. Sydney: MacMillan.

Appendix three
Consent form

I have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to participate, I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researchers on the understanding that my name will not be used. *(The information will be used only for this research and publications arising from this research project).*

I agree to the interview being audio taped.

I also understand that I have the right to ask for the audio tape to be turned off at any time during the interview.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signed:

Name:

Date:

Address:

I wish to have a summary of the research findings sent to me at the above address.
(Please tick) _____

Appendix Four

The lives of loggers

Information sheet

My name is Steve Rowsell and I am completing a Doctorate at Massey University. My supervisor is Regina Pernice, a senior lecturer in Rehabilitation Studies. This project has the approval of the Massey University Human Ethics Committee.

I am interested in hearing about personal experiences of forest workers in New Zealand and any important issues that may contribute to the daily life in the bush. The aim of the study is to better understand what factors are part of the daily lives of loggers including climatic conditions, safety, production pressures, changing economic conditions, training, pay rates, regulations and the social life in the logging gang. To do this I would like to informally interview some people so that they can tell me what working in the forest means to them, what dangers, hassles and other issues concern them and contribute to their job as forest workers.

The interviews will be done over one or two sessions depending on individual wishes. I will ask some questions about production pressures, weather, safety, training, equipment, leadership, work culture, and other conditions during the interview but will also be guided by what have been important issues for you. The interviews will be audiotaped and transcribed by me for later analysis. The tapes will be stored in a secure place and will only be accessible to my supervisor and me. No names will be used on any of the materials. This is to ensure anonymity as well as confidentiality. All tapes and transcripts will be destroyed at the end of the project.

You are invited to take part in this study but participation is entirely voluntary. If you choose to take part, you have the right to refuse to answer any questions. You may ask for the tape to be switched off at any time during the interview or withdraw from the study at any time. You are encouraged to ask questions about the study at any time. Any information that you provide is on the assurance that your name will not be used in the report without your permission. You will be provided with a summary interpretation of your answers to ensure that your experience has been interpreted in a way that you agree with. If you agree to take part, it will be under the conditions set out in this information sheet.

Please contact me or alternatively my supervisor if you have any questions. If you leave a message with your phone number at the Rehabilitation Office, phone (06)3505184, I will return your call as soon as possible. My supervisor may be contacted at the same number.
Thank you, Steve Rowsell.

Appendix Five

Summary of Findings

32 Worcester Street,
Palmerston North.

Dear

It is now quite a while since I last interviewed you about the lives of loggers. Here is a summary of my findings.

The logging industry has gone through a lot of changes and is still going through changes. This affects what happens in different crews. Some of the things which have produced this change are:

- The sale of New Zealand Forest Service. This has changed the focus from a government department designed to service the New Zealand economy, to a set of companies which are focused on making maximum profits
- The continued shift to contracts and the end to wage crews
- The introduction of the Health and Safety in Employment Act 1992
- The emphasis on training through LFITB and FIRS
- The demand for trained loggers in company forests by 1996
- The high prices for logs in 1993/94 followed by the big fall in prices from 1996 to 1998
- The increased demands for paperwork
- The growing presence of mechanised harvesters and haulers
- The big reductions in numbers of crews

Other things which were found to have an affect on crew operations were

- the weather - especially in hill country, where crews may be unable to operate for months on end
- quality and type of machinery
- whether or not a crew worked for a company
- availability of trainers and training.

The FIRS training system

There was a strong belief amongst many loggers, especially in the woodlots, that FIRS based training does not cover all the things you need to become a good logger. Many loggers did not understand that someone who gets a module is only qualified to start doing a job but should not be considered to be an expert. One other big problem with FIRS training was the way the training was carried out. Other criticisms were

- some trainers inexperienced
- some trainers did not put enough time into the job
- many trainees went into courses even though they didn't really want to be loggers
- the courses were too short
- the courses did not have enough practical work in them
- the courses didn't teach trainees to produce at a high enough level
- the course placed too much emphasis on safety
- there was too much bookwork

On the other hand most loggers who had been on a course were fairly happy with them. They said the trainers had more time to teach them than happened on the job. They said good trainers gave them careful instruction, spent a lot of time showing them how to do things, letting them try for themselves, then giving them more instruction. They claimed that this never really happened in short training sessions once they started a job.

Many contractors had little time to spend on training. New loggers had to learn by their mistakes or through watching others, perhaps after a brief course. Loggers said there was not much follow-up in training. Once they were on the job it was mainly up to themselves. Some felt their boss didn't want to train them any more than they had to. They found that bad habits could develop easily and felt there was a need for more follow-up.

In the earliest interviews I, did company crew loggers were very positive about what training would do for the industry, and were happy with the way most contractors were encouraging training. Later, mainly as the demand for logs declined, they became very discouraged. A lot blamed the company for the way they reduced trainers, cut back on money for training, and placed the responsibility for training on contractors and workers.

Production Pressure

Many workers felt safety was badly affected by production pressure, though many contractors said there was no production pressure in their crews. Some of the things linked to production pressure were

- being forced to take shortcuts
- having to use badly maintained or inadequate machinery
- being forced to work where it was breaking the bush code
- having to go too fast
- working longer hours so they got fatigued
- not having enough breaks
- doing jobs that they were not properly trained for because there wasn't enough time to learn the skills

Loggers experiencing production pressure often blamed the companies for this, saying tender prices had kept going down so that crews had to work harder just to stay afloat.

The changing industry

One important finding in the research was the way that different contractors reacted to the changes in the industry. Loggers said companies demanded more in terms of paper work, through policy statements, reports, critical rules, and also forced through lower tender prices. Contractors who were able to develop good business skills did well. They began to organise better and improve safety and training to meet the criteria the companies had for preferred suppliers. If they could keep improving they stayed at the top of the company list. Others found it harder to manage and struggled or even lost their contracts. Some then left the company and went into woodlot logging. Because the woodlots don't have so many rules there was less demand for them to change their organisation and business strategies. This led to a gap between the way many company crews operated and the way many woodlots crews operated.

At the very extreme the fringe or 'cowboy' contractors ran fairly make-shift operations and were often very inefficient, running poor machinery and working in difficult blocks. They seemed to take quite a few risks because they did not have adequate machinery, often their workers were untrained, and they struggled to find work on a consistent basis.

The falling log prices had a big effect on relationships between workers and contractors, mainly because contractors were under pressure and had to demand more work out of their workers. As things got tougher, frustrations often grew and there was quite a bit of friction and resentment in some crews. Workers report being abused by frustrated bosses and even pushed around. They say they were forced to take risks and break the bush code.

Workers needs

Workers were especially concerned about security of employment and so tried to get into well run crews which were likely to get the best contracts. Because well trained loggers tended to go into the best crews, marginal crews were always struggling not just with contracts and the hard and difficult blocks, but with less well trained workers. This made it very hard for some contractors to break free from the worst blocks which would have enabled them to develop better organisation and improve their machinery

Workers valued a contractor who respected them and treated them positively. They felt fair money was important but also wanted thanks for the work they did, and to be made to feel part of the operation. They wanted to be allowed to operate safely and to be helped to train to improve their skills. They appreciated bosses who gave the odd treat as a way of showing friendship and appreciation, such as the occasional tray of beer or a trip fishing. There were some really good contractors - I have called them **transformational contractors** in my thesis because they were able to keep pace with changes, adapt as new pressure emerged, and improve their operations and yet keep good relationships with their workers. They pushed training and ran safe crews. They had genuine concern for their workers. The workers appreciated this and worked hard for them - which of course helped them with production so they could continue to run the best crews.

As conditions have got tighter economically contractors have had to produce more and more to stay afloat. Even the best contractors found it hard to stay afloat and still run a safe crew when tender prices got very low. Contractors felt trapped because they have big debts on their machinery. There seemed to be a growing resentment towards the companies - many loggers hark back to the old days when there was a sense of loyalty and belief that everyone shared the good times and the bad. They believed that this was no longer the case. There were exceptions, especially in one smaller company which was admired for its attitude to its crews.

By the time the project was finished the bigger companies were introducing key supplier contracts and some of the contractors and workers I had interviewed had gone out of work. Many of the woodlot crews had gone out of work as well, because of low prices and not enough blocks to log. After the interviews ended prices began to pick up but I have no knowledge of how much this will affect the crews that remain. A major problem seems to be how the industry will attract contractors and workers back when there is a boom. Many have left the industry and it is hard to imagine them being keen to go back, especially the contractors who lost everything when they missed out on tenders.

Finally a word about the contractors right out on the fringes. In some ways these contractors were the most interesting of all. They are from logging days gone by. They have a sense of adventure and excitement. They often like taking risks and hate bureaucrats and rules and regulations. Many run quite dangerous crews, but it seemed that often they were quite good to their workers (if they had any) and they weren't in it just for the money. They found it hard to stay in the industry with the low prices and all the regulations. Yet it would be sad in many ways to see them go. They represent what New Zealand was once like and they are part of Kiwi culture. Their meaning in life is built around the stories of risks, accidents they have

had, danger they have beaten, and giant trees they have felled. They are true loggers and as one worker said to me, the new way is really just like “ a bloody factory without a roof.”

To all those loggers who allowed me into their homes to talk and listen thank you very much. It was an interesting part of my life. I hope some of what I have found will help the logging industry improve the lives and conditions of loggers.

Regards

Steve Rowsell.

Appendix Six

Codes developed from analysis of the data

Note: numbers inserted in brackets to facilitate understanding of coding system discussed in Method

Selective code 1: Reasons why people become loggers (1)

Axial codes:

Non-specific reasons (1,1)

Open codes

- 1) It's just a job (1,1,1)
- 2) There was really little or no choice in jobs (1,1,2)
- 3) I just thought it would be a great job (1,1,3)

Way of life (1,2)

Open codes:

- 1) I liked the idea of the general lifestyle (1,2,1)
- 2) I wanted the adventure (1,2,2)
- 3) I wanted risk (1,2,3)
- 4) I liked the idea of freedom and the lack of restrictions (1,2,4)
- 5) I liked the idea of hard physical work (1,2,5)
- 6) I liked the idea of driving that sort of machinery and/or that type of operation (1,2,6)

Self image (1,3)

Open codes:

- 1) It was just in my blood (1,3,1)
- 2) I wanted to be a logger like in the old days (1,3,2)
- 3) It's a tough macho life that I wanted (1,3,3)
- 4) I wanted skill prestige and pride (1,3,4)

Rewards (1,4)

Open codes:

- 1) It's good money (1,4,1)
- 2) Hours worked (1,4,2)

Need to Belong (1,5)

Open codes:

- 1) I went to be with my mates (1,5,1)
- 2) I liked the idea of being part of a close team (1,5,2)

Selective code 2: Interpretation of regulations (2)

Axial codes:

Responses to the Health and Safety in Employment Act 1992 (2,1)

Open codes:

- 1) The January 1996 Forests Owners' Association(FOA) policy statement
- 2) Company rules and policies (2,1,2)
- 3) Knowledge of regulations (2,1,3)
- 4) Changing perceptions of what the Act means (2,1,4)
- 5) Covering ones back (2,1,5)

The bush inspector (2,2)

Open codes:

- 1) The bush inspector's own perceptions (2,2,1)
- 2) Contractors views of the bush inspector (2,2,2)
- 3) Workers views of the bush inspector (2,2,3)
- 4) Colluding against the bush inspector (2,2,4)

Systems for implementing safety regulations in the crew (2,3)

Open codes:

- 1) Supervisor checks (2,3,1)
- 2) Hazard IDs (2,3,2)
- 3) Accident reporting (2,3,3)
- 4) Flouting regulations (2,3,4)

Influences which shape perceptions of regulations (2,4)

Open codes:

- 1) Regulations as an anathema to bushmen (2,4,1)
- 2) Individual responsibility, fatalism (2,4,2)
- 3) Production pressure (2,4,3)
- 4) The realities of prosecution and workers' rights (2,4,4)

The crew and safety (2,5)

Open codes:

- 1) Violations (2,5,1)
- 2) Building a safety climate which fosters regulation compliance (2,5,2)
- 3) Maintaining safety behaviour (2,5,3)

Selective code 3): Perceptions of learning (3)

Axial codes:

Learning in the bush (3,1)

Open codes:

- 1) Holding on to the past (3,1,1)
- 2) Learning takes time and is ongoing (3,1,2)
- 3) Lack of help (3,1,3)
- 4) Trial and error (3,1,4)
- 5) Observation (3,1,5)
- 6) Guidance and instruction (3,1,6)

Perceptions of formal training (3,2)

Open code:

- 1) Views of FIRS (3,2,1)
- 2) Views of pre-entry courses (3,2,2)
- 3) Views of formal on-the-job training (3,2,3)
- 4) Views about trainers (3,2,4)

Maintenance of the training (3,3)

Open code:

- 1) FIRS does not have built in maintenance (3,2,1)
- 2) Follow-up by trainers (3,2,2)
- 3) Company supervisors (3,2,3)
- 4) Contractors (3,2,4)
- 5) Factors which conflict with training (3,2,5)

Selective Code 4): Organisation (4)

Axial codes:

Machinery and personal protective equipment (4,1)

Open codes:

- 1) Large machines (4,1,1)
- 2) Tools and personal protective equipment (4,1,2)
- 3) Maintenance (4,1,3)

Contract issues (4,2)

Open codes:

- 1) Outside input (4,2,1)
- 2) Company demands (4,2,2)
- 3) Insecurity of contracts (4,2,3)

Production pressure (4,3)

Open codes:

- 1) Declining market (4,3,1)
- 2) Weather and terrain (4,3,2)
- 3) Inefficiency (4,3,3)
- 4) Pressure and risk (4,3,4)

Planning and communication (4,4)

Open codes:

- 1) Planning each block (4,4,1)
- 2) Planning ahead (4,4,2)
- 3) Bookwork (4,4,3)
- 4) Communication (4,4,4)

Selective Code 5: Crew relations (5)

Axial codes:

Financial incentives (5,1)

Open codes:

- 1) Money (5,1,1)
- 2) Incentives (5,1,2)
- 3) Allowances and hours (5,1,3)
- 4) Security of employment (5,1,4)

Symbolic appreciation (5,2)

Open codes

- 1) Incentives, bonuses and annual extras (5,2,1)

Verbal appreciation (5,3)

Open codes:

- 1) Praise and thanks (5,3,1)
- 2) 2) The boss switches off (5,3,2)

Aversive interaction (5,4)

Open codes:

- 1) The boss yells and swears at us (5,4,1)
- 2) Threats and assaults (5,4,2)
- 3) Abuse and workers' rights (5,4,3)

Contractor behaviour (5,5)

Open codes:

- 1) Setting an example by working hard (5,5,1)

- 2) Setting an example through skill (5,5,2)
- 3) Instils sense of pride (5,5,3)
- 4) Develops safety culture (5,5,4)

Appendix Seven

Personal Communication

- 1) Lester Bell, Researcher into Forest Accidents at OSH, Wellington
- 2) Mark Fielder is OSH scientist based in Rotorua and has worked as a logger and forest researcher
- 3) Roger Gale is a trainer of logging and silviculture skills with Aupouri Trust in the Far North
- 4) Richard Gibson was a researcher for LIRO in Rotorua.
- 5) Blair Haggart, forestry consultant and ex-woodsman from Manawatu
- 6) Dan Henderson, a contractor and ex-woodsman from the Far North.
- 7) Rick McAslan, Manawatu Polytech Trainer and previous woodsman and administrator in New Zealand Forest Service.
- 8) Vivienne McLean is a forest industries researcher and writer based in Whitianga
- 9) Helen Moffat is a researcher at Massey University, investigating safety in New Zealand forests
- 10) Mike Newbold was CEO at LFITB from its beginnings in 1978 to when it was privatised in 1998.
- 11) Brian Saunders, Manager of CHH operations in Hawkes Bay and East Coast
- 12) Greg Steele has worked as an officer in the New Zealand Forest Service, been a consultant in forests related industries, and during the study was firstly working for LFITB developing training standards and latterly at FITEC as the SOC manager for forestry. In late 1998 he began work as a semi-autonomous trainer for CHH.
- 13) Colin Sutherland was District Ranger for the Northland region of the New Zealand Forest Service during the 1970s and 1980s.
- 14) Brian Vincent has worked as a logger with many operations, been a trainer for NZFP, was involved in the development of the loggers certificates and the establishment of LFITB, and worked for LFITB as second in command until retirement in 1998

Appendix Eight

Glossary

Arch: The structure attached to the back of a skidder. The logs are bundled and pulled tight into the arch to secure them and to control them while they are being hauled from the bush.

Backcut: On the opposite side of the tree a straight cut is made with a cross cutting saw to complete the severance of the tree from its base started by the scarf.

Bar: The flat plate on the front of the chainsaw around which the chain rotates.

Barbers chair: A large shard of timber left on the stump when the tree is felled.

Bell logger: A machine which is used for manoeuvring logs and pulling them around the forest. It is highly manoeuvrable as it pivoted in the middle and thus can turn in tight circles.

Benching: A layering of the ground like a tier: steps in levels

Birdnest: tangled rope

Block: A pulley

Block: An area of forest

Borecut: A cut made with the tip of the chainsaw through the centre of the tree as if boring with a drill. This is to assist in releasing tension in a tree

Breaking out: Pulling the logs away from the felling face after they have been felled.

Breaker out: Person who assists in attaching strops or grapples to enable logs to be hauled from the felling face to the skid.

Bush code: A booklet published by OSH which contains the legal requirements for operating safely in the bush.

Canopy:

- i) The upper foliage of the tall trees in a forest.
- ii) The covered frame of a machine which reduces danger should the machine roll over, or an object fall on the machine

Chainbrake: A lever mechanism on the front of the body of the saw which flicks on and stalls the chain if the saw kicks back.

Chaps: Chainsaw leggings which have many layers of fibre designed to stall the chain of saw if the bar cuts through the leggings

Clear fell: When all the trees in a block are felled, either to waste or for extraction.

Clearwood: Timber which has no knots in it.

Coathangers: Trimmed branches not cut right back against the trunk and thus leaving a stub

Cross cutting: Cutting with a saw across the grain of the timber. Once done with a large two-person saw and now done with a chainsaw.

Drag: The path along which a skidder hauls the logs to the skid from the felling face.

Drive: To use tree to force another one which has sat back or become hung-up after the back cut has been made.

Drop start: An illegal method of starting a chainsaw where the starter cord is held and the saw is dropped away from the cord.

Escape route: A system the faller uses whereby he or she clears an adequate path away from the tree about to be felled before it is scarfed.

Faller or feller: A logger who fells the trees.

Felling face: The point at which trees are currently being felled. Usually, unless the block of trees is felled from the edge, an area is chosen somewhere in the block which is most suitable for beginning the felling. To open up the felling face trees are felled until sufficient space is available for a felling face to be established. This opening up of the bush is considered one of the more dangerous activities because there is more likelihood of hang-ups and sit backs.

Fleeting: Sorting the logs into different types ready for trucking out.

Forwarder: Machine with carriage which self loads then carries the logs to the skid from the felling face

Front cut: An alternative to a scarf when the tree is small.

Grapple: Rather than using wire rope or chain many machines now use grapples which pick up the logs in a bunch. A grapple may be used on a loader, a skidder or a forwarder. Increasingly hydraulic diggers are being adapted to forest works and are very suitable for grapple work.

Guy ropes: Wire ropes used to stabilise a machine or structure such as a hauler.

Hang-up: When a tree does not fall because its upper branches catch in other tree and prevent it falling to the ground the tree is said to be hung-up. Wedges may be used to force the tree down, another tree may be felled against it (driven) to force it over, or a machine used to push or pull it over.

Hard-hat: Once metal but now plastic, a helmet used to protect the wearer from falling or flying objects.

Hauler: Usually a stationary machine, a hauler is sited at a point from which cables can be run out to points near the felling face. The strops or grapple are then attached to the logs and the cable hauls them back to the skid's landing site.

Hazard ID: A hazard identification procedure which is required by law before an operation in the bush takes place. All potential hazards are identified and recorded.

Heavy leaner: A tree which is leaning extremely in one direction.

Hinge wood: The wood which is left uncut between the back cut and the scarf. It is left to reduce the likelihood of the tree slipping off the stump, spinning sideways, or sliding backwards. It also allows control over the direction in which the tree falls providing it is done correctly. Hinge wood is considered a vital aspect of the tree felling process. In *pinus radiata* the long stringy fibre of the wood makes the use of hinge wood particularly valuable. In some trees, for example eucalyptus, hinge wood is less useful because the wood fibre is shorter and more brittle, and thus does not hold the tree as long as is the case in *pinus radiata*. Hinge wood is also called holding wood in some instances. Loggers maintain they can tell how well a tree was felled by looking at the remains of the hinge wood, and the slash that is left behind.

Kickback: When the front or tip of the chainsaw bar hits an object it can flick upwards when a cut is completed and the bar comes in contact with an adjoining log, or when trimming is being carried out and the bar tip catches another branch. When the kickback occurs, the movement is sudden and the momentum is such that it can be very dangerous to the saw user. Upper body injury is the most likely accident outcome.

Landing site: The place where logs pulled from the felling face by a hauler come to for processing: It is part of the skid site.

Loaded: When undue tension is applied to a tree accidentally or intentionally the tree becomes loaded and can act as a spring when the tension is released.

Loader driver: Drives the loader which moves the logs (fleets them) and loads them onto the truck. The loader driver may also assist in sweeping the skid to clear it of slash trimmed by the skiddies.

Log maker: The logger who measures, marks and cuts the logs to suit the specifications of the buyer.

Marking: A symbol or numbers is painted onto the log, often with a stencil, to signify the grade and perhaps destination of the log.

Machine operator: General term used to describe someone who operates a machine other than a chainsaw or truck in the bush.

Maul: Large mallet used for driving wedges

Mechanical harvester: A machine which reduces the amount of manual work required to fell and process trees. Often on tracks, many of the harvesters available can cut the tree at its base, delimb it, and even cut it into appropriate lengths. Currently harvesters are restricted to about 25 degree slopes but technology is likely to increase its range considerably.

Mitt: Protective mitt made of leather attached to the upper handle of the chainsaw

Overcut: When one cut of a scarf is extended beyond the other

Piece size: Average size of logs from a given area.

Production thinning: Thinning the forest and extracting the felled trees for use: such as posts, poles, pulp, or small logs wood.

Pruned butt: The part of a tree which has been pruned and, providing the pruning has been down correctly and early enough, which contains clearwood.

Pulpwood: Timber used for crushing for pulp to make paper products

Recoil: : This occurs when the chain contacts a foreign object, forcing the saw straight back at the operator.

Sailer: A branch which falls from the trees while they are standing.

Sawlog: A log of size and quality sufficient to warrant cutting as timber

Scarf: A wedge shaped cut in a tree which is generally made to encourage the tree to fall in the direction of the widest part of the wedge.

Shake: A crack through the length of the log - usually there already but also developing when the tree falls too heavily.

Sit-back: The tree is meant to fall in the direction of the scarf, and thus away from the back cut. However, if there is too much weight in the trunk and branches on the backcut side, or if the tree is leaning in a direction which is not the same as the wedge, the tree may sit back... the back cut closes as the tree attempts to fall toward rather than away from the back cut. Wedges are then used to force the tree over in the correct direction. Alternately another tree which is easier to fell correctly may be felled toward the tree which has sat back, thus forcing it to fall in the right direction

Skid: The area which is used to process the trees and ready them for transport out of the bush. In small blocks this may be an adjoining paddock, but in the larger forests an area is cleared and bull dozed flat to give sufficient space for easy movement of workers, machinery, and trucks.

Skiddie: The logger who works on the skid as a general operator: A skiddie may do some log making, as well as trimming, marking and moving logs, as well as unhooking the strops from logs when they are brought into the skid.

Skidder: A machine which is used to drag the logs from the felling face

Slabbing: Splitting in wood caused when felling or cross cutting

Slash: The branches and leaves/needles trimmed from the tree.

Sloven: Remains of the holding wood and or scarf left in the log after it is felled

Spar: i) A dead tree - potential danger in wind or when struck by another tree being felled.
ii) A log used as a pole to attach cable, guy wires or other equipment to, usually used in a hauler operation.

Splice: A kind of knot/threading used to join two pieces of rope or to make a loop in a single piece.

Steel toe caps: Boots which have steel caps in the toe to protect the foot: a legal requirement in the forest.

Stem: Main trunk of the tree.

Stockpile: Stacked logs

Stroke delimber: mechanical delimber which picks up logs and strips them of branches as well as often cutting them into appropriate lengths. Often used in hauler operations.

Strops: Lengths of wire rope or chain which are attached to the rope of the skidder which is used to drag the logs from the felling face.

Tension: When weight or stress is applied to a tree so that the fibres in the wood are stretched in an unnatural direction. The tree is then 'loaded'.

Thinning: Cutting out some of the trees in a block to reduce numbers so that the remaining trees can grow better.

Thinning to Waste: Thinning the forest and leaving the felled trees to rot.

Visor: A mesh protection attached to the front of the hard hat to shield the face from chips, branches, kick back and other hazards

Wedges: tools used to open the gap between the stump and the log. They are driven into the backcut at strategic points to assist or alter the direction in which a tree is falling. They are especially valuable when the tree sits back. Wedges used in the past were steel but now are generally plastic - and hence are not only lighter to carry but also less damaging to the saw should the chain accidentally hit them.

Whitefinger: damage to the fingers of machine operators caused by vibration: the fingers go white through lack of blood flow.

Winch: Cable drum used to pull rope.

Windthrow (or windblow): Trees which have been felled or badly disturbed by strong winds. Such trees can be very dangerous to fell as they are tensioned, and under stress.

Wingcuts: Near vertical cuts made on the side of the tree from above the back cut down to it - to decrease the likelihood of tearing and splitting of the wood as the tree falls.